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British Society for the History of Pharmacy
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British Society for the History of Pharmacy

840 Melton Road, Thurmaston, Leicester, LE4 8BN
Tel: 0116 264 0083, Fax: 0116 264 0141, Email: bshp@associactionenterprises.com

The British Society for the History of Pharmacy was formed in 1967 under the aegis of the Pharmaceutical Society of Great Britain, having originated from its History of Pharmacy Committee.
BSHP seeks to act as a focus for the development of all areas of the history of Pharmacy, from the works of the ancient apothecary to today's ever changing role of the community, hospital, wholesale or industrial pharmacist.

Aims

Promotion of historical studies related to pharmacy.
Advancement of knowledge and propagation of understanding of the history of pharmacy.
Publication of the research work of pharmaceutical historians.
Preservation of pharmaceutical artefacts and historic pharmacies.
Support for the work of relevant museums and offering advice on establishment of other pharma-ceutical exhibits and on the preservation of pharmacies.
Co-operation with related professions and local historians on medico-pharmaceutical topics of mutual interest.

Pharmaceutical Historian

The *Pharmaceutical Historian* has been published since 1967, at first intermittently, but on a regular quarterly basis from 1972. Issues generally comprise 16 pages and cover.
An index for the years 1967-1995 was published in 1998. An index for 1996-2000 was published in 2000 and for 2001-2005 in December 2005.
Papers, short communications and letters in English on any aspect of the history of pharmacy are welcome and should be sent to the address above or by email to *bshpeditor@associationhq.org.uk*
Any illustrations are converted to monochrome for printing. Further details of requirements can be found on the website *www.bshp.org* under Publications.

Membership

Membership costs £20.00 per annum and includes:

Four issues of the *Pharmaceutical Historian*.

Regular meetings, with guest speakers, usually in November, February and May.

Visits to places of historic interest, museums, collections, botanical gardens, etc.

Annual Conference, usually in March/April.

Free use of Royal Pharmaceutical Society of Great Britain's library facilities for research.

Help in historical research and with the identification of artefacts.

Affiliation to the International Society for the History of Pharmacy (ISHP).

Affiliation to the British Society for the History of Medicine (BSHM).

Application forms are available from the Honorary Secretary at the address above or on *www.bshp.org*

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PHARMACEUTICAL HISTORIAN

Editor: Ainley Wade, BPharm, MPhil, FRPharmS, FSP
840 Melton Road, Thurmaston, LEICESTER LE4 8BN

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Diary

BSHP Annual Spring Conference

Berkeley Hotel, Worthing, Friday 4 to Sunday 6 April 2008

All members should have received details. After 1st March accommodation cannot be guaranteed in the hotel. For late bookings and day visitors, contact Dr Shirley Ellis, 1 Willis Way, Bottisham, Cambridge CB25 9BS.

Wednesday 7 May 2008

'Indigenous people and drug development: From local knowledge to new medicines' by Professor Michael Heinrich. Lambeth, 6.30 p.m.

Wednesday 18 June 2008

Visit to 17 Bloomsbury Square, former home of the Pharmaceutical Society. Details to be circulated.

Wednesday 24 September 2008

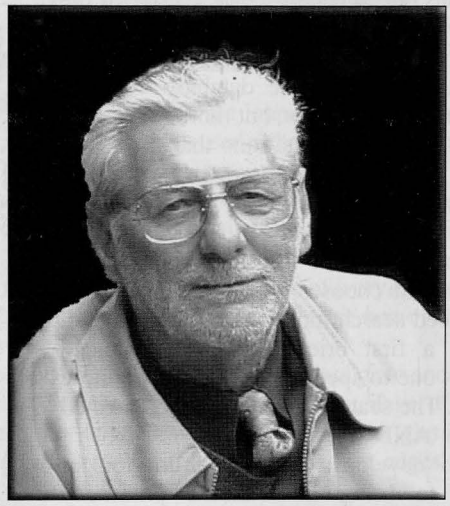
'History of Aspirin' by Mr Diarmuid Jeffreys. Lambeth 6.30 p.m.

Wednesday 19 November 2008

To be announced.

Obituary

William (Bill) A Jackson



We report with regret the death of Bill Jackson, who died on 24th December 2007 at the age of 80. He was a distinguished and active pharmaceutical historian, who was known around the world for his research and expertise on medical and pharmaceutical devices. He was president of BSHP 1991-3 and committee member for much longer, a member of the International Academy for the History of Pharmacy and a recipient of the Society's Leslie Matthews medal.

He was cheerful in spite of his disabilities and frequently attended our annual spring conferences. He had a humorous disposition and was an amusing speaker and writer. His collections of artefacts were in demand for exhibitions and his many papers in the *Pharmaceutical Historian* were a joy to edit. A typical example was his article on Elephant's Milk (2003, 33.4, 64-65).

After a career in community pharmacy he was for many years the honorary curator and emeritus curator of Manchester University medical museum, where he arranged many exhibitions.

Our condolences go to Audrey and their family.

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New tools on the ISHP Website

Dr Christiane Staiger
Neu-Isenburg, Germany

The homepage of the International Society for the History of Pharmacy (ISHP) has recently established two new tools for scientific searches. A database of oral presentations and short introductions to national online search tools may help to strengthen the network of ISHP members. The homepage www.histpharm.org has a new category 'Tools'.

Oral presentations

Under 'Tools', users will find the database 'ISHP oral presentation list'. The page will lead to all the notified talks given since 2005 related to the history of pharmacy worldwide. Beside the title the database contains the keywords, the name of the author and a contact email address. The date, place and occasion of the talk are also given. At present, the database contains more than 500 entries, but more need to be added. Many presentations that are given never reach publication and valuable information may be lost.

The makers of the website focused on a comfortable and user-friendly design. Visitors can choose between a simple or an advanced search mode. The simple search offers a first orientation; the advanced allows one to specify the findings in more detail. The search fields will be connected by the 'AND' operator.

ISHP developed this new online tool in order to bring international pharmacy historians closer together. Therefore, the search modes offer an automatic conversion function on international spelling variations. For example, instead of the letters ś, ş, or ŝ used in other European languages a simple 's' will link to the correct finding. If the user is searching for 'François', either the correct spelling or the simplified 'Francois' will find the relevant database results. When searching for 'Müller', simply entering 'Muller' will do.

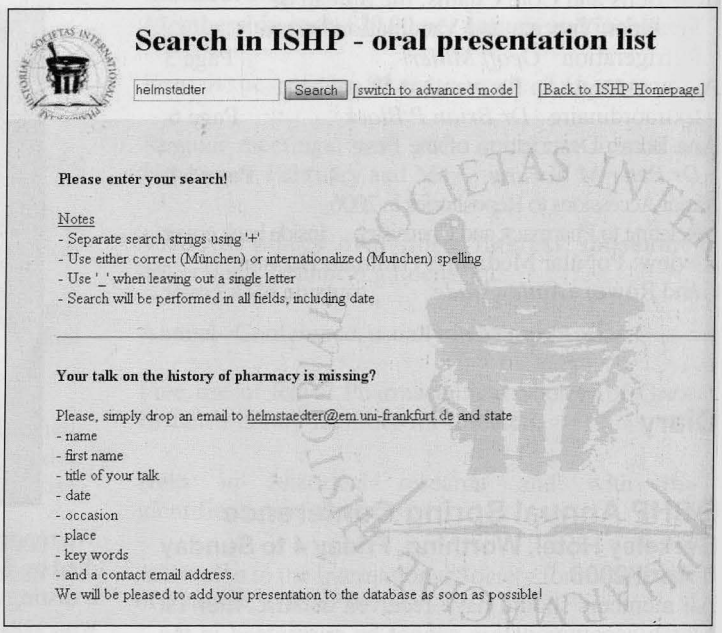
The database is located on a public server to save money for the ISHP. However, most public servers can annoy users with regular advertisements or pop-up windows. ISHP managed to find a less aggressive server. On opening the page, only one window pops up. After closing this, users can search undisturbed for the rest of the session.

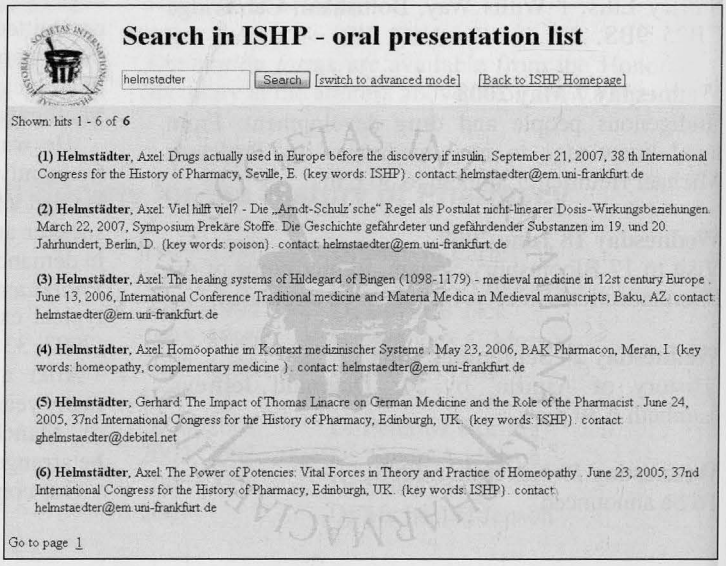
Databases

The second new tool on the ISHP homepage offers short introductions to worldwide literature databases from several countries related to the history of pharmacy and medicine. The General Information includes name, web address (URL), a short description of the database content, and the available languages. The search strategy for each database is explained comprehensively and an example is given. A direct link takes you to the related website.

The new content of the ISHP-homepage is being improved and enlarged constantly. In particular, pharmacy historians are invited to use the ISHP website to notify their talks by email so that they can be included in the oral presentation database.

Author's address: ch.staiger@gmx.de





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Cow Bells and Cold Chains: the Spread of Smallpox Vaccine and Vaccination before Refrigeration

Geoff Miller

Pharmacist and Historian, Western Australia

The histories of transmissible diseases that have afflicted mankind and their containment do not have the happy ending that we can attribute to the history of smallpox, and this is what makes it unique.

When I first started my career in pharmacy in the 1950s, the concept of a 'Cold Chain' for all perishable medicinal products hadn't really been thought of. One exception however was the recognition of the special arrangements required to handle Smallpox Vaccine, since the Commonwealth Serum Laboratories in Australia insisted that, to preserve potency, the vaccine had to be stored in the frozen state, at as low a temperature as possible. Wholesalers despatched the boxed capillary tubes wrapped in layers of newspaper and the parcel was kept apart from other goods in an insulated box in the delivery van. In those days a dispensary refrigerator was a rarity, and most pharmacies stored this vaccine in the freezer of a neighbouring butcher's shop or ice cream parlour.

With such specific storage directions for Smallpox Vaccine, I began to wonder how this product was transported around the world in the days before refrigeration, and on voyages through the tropics often lasting over 3 or 4 months.

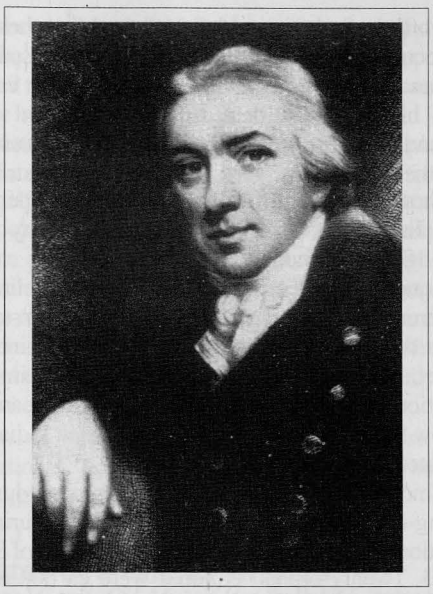
The surgeons of the First Fleet, that was sent from England in 1788 to establish the Colony of New South Wales and a new convict settlement, are said to have brought out 'variolous matter' with them. Exactly what 'variolous' matter means is not clear, but in any case there is no record of their ever having made use of it.

Smallpox was the first disease to which an artificial immunity was created by deliberate inoculation with the causative organism, obtained from the skin blisters of mild cases, This was known as 'variolation', a process which originated in Asia in ancient times. By this deliberate inoculation of smallpox material into a human arm it was hoped that a mild form of smallpox would develop to give immunity in the patient.

The role of Doctor Edward Jenner in the smallpox story is well known, as he was the first to prove scientifically that vaccination (*vacca* - Latin for cow) with cowpox gave protection from smallpox. He also demonstrated that cowpox could be transmitted artificially from one human to another, so vaccination was not dependent on the existence of cowpox in a community. He made these observations public in 1797, only nine years after the colony of New South Wales was established.

Transporting the vaccine

Although Jenner's publications and ideas were spread relatively quickly, there were some difficulties in exporting the vaccine even over short distances or in cool climates.



Edward Jenner

The commonest methods used in the 19th century included:

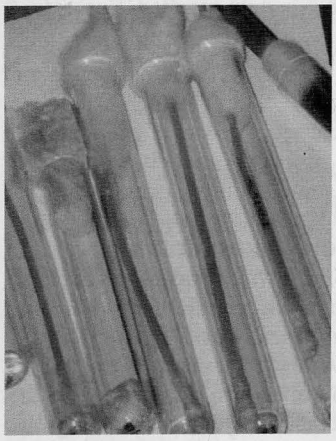
(1) *Drying the vaccine on points*

Lancets made of silver; gold or ivory. Sometimes the liquid lymph on the ivory point was enclosed within a wax ball, and in some Eastern countries, the dried thorns of a bush were used instead of ivory points.

(2) *Drying the vaccine and sealing it between small glass plates*

A pool of Vaccine was dried on a glass plate and when it was perfectly dry a thin coat of mucilage of Gum Arabic was applied. Alternatively another glass plate was placed over the dried vaccine and the edges sealed with wax

(3) *Using lengths of thread to soak up the vaccine, which were then dried*



Initially this was the commonest method, and it was similar to the variolation process using threads or clothing impregnated with material soaked up from smallpox pustules. Again the dried threads were sometimes sealed between two glass plates, or sealed in tubes with wax.

Dried vaccine on threads in sealed glass tubes

(4) *Dried crusts or scabs*

Edinburgh surgeon James Bryce, discovered in 1809 that the crust or scabs which form at the vaccination site also contain viable vaccine virus.

In 1813 Dr Russell, of Calcutta, sent some dried scabs from pustules of cowpox to Dr D'Arcy

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Wentworth in Sydney, and he cautioned that these had to be reconstituted with cold water. He also despatched ivory lancets that had been moistened with the vaccine but in his view the desiccated form would better withstand the rigours of transport from India to Australia.

By these methods vaccine was soon distributed throughout Britain and to North America, southern and central Europe and the Mediterranean basin by 1800, and by 1801 to Scandinavia and Russia.

For longer distances, particularly in warmer climates, a different method was used. Weekly arm-to-arm transfer through volunteers or children maintained the vaccine. This had the advantage that the immune population could be increased at the same time, and this was how the majority of the British forces in India were vaccinated.

The most famous exploitation of this procedure for the long-distance carriage of vaccine, was during an expedition, commissioned by King Charles IV of Spain, in 1803. Twenty orphan children were carried on the ship to provide a succession of susceptible subjects for vaccination to the Spanish colonies in the New World, China and the Philippines. However, more convenient methods were clearly needed.

In Great Britain the National Vaccine Establishment took over the responsibility for maintaining serial arm-to-arm transfers in 1808, as well as distributing several thousand preparations to physicians each year on ivory points or glass slides. Later, capillary tubes filled with vaccine diluted with 50% glycerol were used, but ivory points were still being employed in Great Britain as late as 1898.

A French researcher, M. Bretonneau of Tours, described a method of using fine glass tubes with a small expansion in the middle to collect and store drops of fluid from a punctured vesicle.

The Vaccinator of the Public Dispensary in Edinburgh, Dr William Husband, published another method of preserving lymph in capillary tubes in July 1851. He demonstrated the method of filling and sealing fine tubes of glass containing lymph, which had a long shelf life and could be carried in a doctor's bag without refrigeration. Husband advocated strongly the keeping of exact records of the source of the vaccine as well as the success or failure of the vaccination.

Small Pox and Vaccine in Australia

On board the flagship *Sirius*, which was part of the First Fleet carrying convicts, their guards and some free settlers to New South Wales, was Surgeon Thomas Jamison, who holds several special places in the history of Australian medicine. Jamison's tour of duty in the Antipodes was an incredible 21 years, and during that time he had only one trip home to England in 1801, during which time he encountered first-hand experience with Jenner's new discovery of cow pox vaccination, and became a total convert.

In New South Wales the first settlers at Sydney Cove became very alarmed when smallpox disease was seen on a large scale among the indigenous population and it had wreaked havoc among the unprotected tribes. The question then arose as to the source of the outbreak, as Australia had enjoyed a natural isolation by virtue of its geographical position up until that time. It was thought that this outbreak could have been attributed to a previous visit to the east coast of New Holland (now Australia) by Captain James Cook, or landing parties of early French explorers, but this was only conjecture.

When Dr Jamison returned to Sydney after his leave in 1802, he was appointed Principal Medical Officer in the Colony. He shared with the Governor, Captain Phillip Gidley King RN, a great concern over the threat of smallpox to the white population.

In May 1803, a letter was sent to the Secretary of State, in London, suggesting that 'vaccine matter' should be sent urgently to the colony. In response, a supply of vaccine lymph, obtained from the Royal Jennerian Society, was despatched to Dr Jamison in the transport ship *Coromandel*, which arrived in May 1804. A second packet of lymph also arrived on the same vessel, addressed to Assistant Surgeon John Savage, which was 'put up in a different way from that sent by the Royal Jennerian Society.'

On receipt of the lymph, Dr. Jamison immediately vaccinated three children at the 'Orphan Asylum' and some other persons were vaccinated by Mr. Savage. Their efforts were successful, for a notice appeared in the *Sydney Gazette* on 3rd June, 1804 stating that 'the cow-pox is now fully established in the Colony,' and invited parents to have their children vaccinated.

Thomas Jamison was one of the founders of preventative medicine in Australia, and he showed great concern for the welfare of children in the colony. On October 14th 1804, Dr Jamison published a paper entitled 'General Observations on the Small-pox' in the *Sydney Gazette* in an attempt to make parents and carers of children aware of the dangers of smallpox and the benefits of vaccination. This article was quite lengthy and it has further interest in the fact that it was the first medical paper ever published in Australia.

By the 1820s, the most serious problem was the failure of imported smallpox vaccine, as several people who had been vaccinated in New South Wales contracted smallpox on their return to Europe. After the middle of the nineteenth century, Western Australia was the only Australian colony still receiving convicts from Britain, and the Surgeons Superintendent on board those convict ships coming to Australia were given written instructions as to their duties whilst at sea, which in part read 'you are to keep such a succession of vaccinated cases as may enable you to convey fresh virus to the colony and to obtain an acknowledgement from the medical officer of the Colony, stating whether you have delivered to him any recent virus consequent upon vaccination of individuals during the voyage.'

Up until 1881, the New South Wales Government received regular despatches of Calf Lymph from Bombay, as well as a constant, though small supply, of glycerolated vaccine from England, which it sometimes shared with the newer colonies of South

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Australia and Western Australia. It was about this time that the American physician and surgeon Henry Austin Martin introduced the production and use of non-humanised smallpox vaccine from the calf.

Unlike human lymph transmitted arm to arm, vaccine propagated serially in calves preserved potency, avoided vaccinal syphilis, and enabled manufacture in commercially profitable quantities. Martin was also credited with standardising the vaccine virus. No lymph was 'cultivated' in New South Wales, which could have been disastrous should an epidemic have occurred, but after 1881 supplies were obtained from vaccine stations in Victoria and New Zealand.

Victorian production was first started by a veterinarian, Graeme Mitchell, who produced calf lymph for smallpox vaccination privately on the site occupied by the present day Commonwealth Serum Laboratories in Victoria, near Melbourne. However, strict regulations were then in force to prevent anyone but a qualified medical practitioner giving vaccinations. The original wooden building and stables for the calves, known initially as the 'Calf Lymph Depot' and later as the 'Vaccine Depot', was taken over by the Victorian Government in 1883 and then by the Commonwealth Government in October 1911.


COMMONWEALTH OF AUSTRALIA

QUARANTINE SERVICE

JENNERIAN LYMPH (VACCINIA VIRUS)

The Lymph issued by these Laboratories is carefully cleaned by Glycerine Treatment and is of high potency

Director **Commonwealth Serum Laboratories,** Royal Park, Melbourne,

SYDNEY: The Pathological Laboratory, ... Elliott Brothers, Ltd., and The Australian Drug Co. Ltd

MELBOURNE: Duerdin & Sainsbury, ... H. Francis & Co., ... Scientific Supply Co. ... Rocke, Tomett & Co. ... Felton, Grimwade & Co., ...

ADELAIDE: A. N. Basford & Sons, Ltd. ... F. H. Faulding & Co. ...

PERTH: F. H. Faulding & Co. ...

LAUNCESTON: Hatton & Laws. ...

As vaccine supplies became more reliable in the mid-fifties, all of the Australian States except New South Wales and Queensland had passed Acts requiring the compulsory vaccination of children below varying ages. In addition, all of the Australian States had established Vaccine Districts and appointed Public Vaccinators to ensure that protection against smallpox was widely available.

Routine smallpox immunisation in Australia came to an end in the 1970s, but the Commonwealth Serum Laboratories kept the vaccine on its inventory right through until the early 1990s when the decision was finally made to discontinue the product.

The outlay required to develop a modern production process, along with the clinical trials and regulatory requirements could not be justified commercially, and the Australian government would have to rely on an overseas supplier, should vaccination against smallpox ever become necessary again.

We have now come full circle. Advances in refrigeration technology meant that a freeze-dried vaccine could be produced which was more potent and stable than the original vaccine, allowed easier transport and reduced the cost of bringing large amounts of vaccine to remote areas. As a result, in 1967, the World Health Organization began implementing its plan to intentionally eradicate a biological species from the earth. By 1979 this was achieved and the demise of smallpox was regarded as one of the great triumphs of modern science. However, we must also recognise the achievements and the ingenuity of the early pioneers of smallpox prophylaxis in the eighteenth and nineteenth centuries, which are even more remarkable when it is remembered that their work was accomplished before the cause of the disease was known.

This paper was presented to the 37th Congress of the International Society for the History of Pharmacy, Edinburgh June 2005.

Author's address: gcmiller@iinet.net.au

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Antoine-Augustin Parmentier: Pharmacist Extraordinaire

Dr Brian P Block
London

Antoine-Augustin Parmentier, who lived in the 18th and early 19th centuries, rose to considerable eminence in the fields of pharmacy, agriculture and nutrition. He was on friendly terms with the king, various aristocrats and many eminent scientists, and his name was a household word throughout France where he lived and worked. Today, however, outside culinary circles he is little recognised in France and he is virtually unheard of in Britain.

He studied pharmacy and joined the army at the beginning of the Seven Years War in order to further his career whilst avoiding the unaffordable expense he would have had to incur as a civilian in order to qualify. He rose to be chief pharmacist in the army and never relinquished his military career even after becoming chief pharmacist at the prestigious *Hôtel des Invalides*, the hospital for wounded and retired indigent soldiers, and later being given a sinecure, lodgings and an income for life by the king himself. He died still a soldier in 1813. He never married.

His enthusiasm for work was boundless. He willingly did whatever was asked of him: problem solving, investigations, surveys and analyses caused him to travel all over France and this was in addition to pursuing his own interests in the field and in the laboratory as well as a prodigious output with the pen. Although he became increasingly interested in agriculture – an interest engendered by the frequent crop failures and subsequent famines in France in his day – he never forgot he was a pharmacist and made important contributions to hospital hygiene and with his production of pharmacopoeias for military and civilian use. He was a founder of the Pharmaceutical Society of Paris and of the *Pharmacy Bulletin* which became the *Journal of Pharmacy and Chemistry* by amalgamation, and he later founded a school of baking at which he taught.

His concern was specifically directed to the poorer people who had inadequate food; the staple diet was bread and when wheat crops failed people starved. This state of affairs caused him to research the possibility of using other vegetables instead of or as a supplement to bread and he was a pioneer in the study of nutrition and in the analysis of various foodstuffs at a time when nutrition was virtually an unknown term and organic chemical analysis was barely in its infancy and extremely basic.

His researches led him eventually to consider the potato, a vegetable that was despised in France where it was occasionally fed to cattle, but eaten widely in other European countries and, of course, in South America where it originated.

By dint of hard work and with the backing of the king he showed that the potato could be used as a partial or total substitute for flour in bread-making and could be eaten when boiled, baked or roasted in embers. There is little doubt that Parmentier single-handedly popularised the use of the potato in France against very strong opposition and prejudice and it is with the potato that his name in France is associated. Any French dish with his name attached, for example, *potage Parmentier* (potato soup), indicates that potatoes are a main ingredient.

Early Life

Largely due to the prosperous cloth trade together with the well-watered soil that produced wheat and later maize in abundance, Montdidier (Somme) was home to a good many bourgeois families among which were the Parmentiers. Jean-Baptiste-Augustin was the son of Sebastien Parmentier, the husband of Françoise Lefebre, and on 6 June 1735 he married Marie-Euphronsine Millon, daughter of Antoine Millon and Suzanne de Beauvais. For many years the Parmentiers had been the backbone of the bourgeoisie: there had been a Parmentier cannon-maker, a maker of tin pots and since the tenth century the family had produced several mayors. But over the years the Parmentiers had slid down the socio-economic ladder and Jean-Baptiste was a modest draper with a small lingerie shop (now a HiFi and TV repair shop) situated on rue Mercerie, now rue Parmentier, which was and still is the main street of the town. The shop occupied all the ground floor and the family were confined to two modestly sized rooms on the floor above.

The first born of the new generation was Marie Suzanne, born on 14 April 1736, and the first son, Antoine-Augustin, was born sixteen months later on 12 August 1737. Three other children followed: Charles-Nicholas-Sebastien on 4 November 1739, Antoine-Simon on 28 October 1741; and Paul Luglien on 10 January 1744. A few years later, however, a double tragedy struck the family. Charles-Nicholas-Sebastien and Paul Luglien both died within a few months of each other, Charles aged eight in August 1748 and Paul aged five in January 1749.

The church of St Sepulchre, next door to the house where he was born, was where Antoine-Augustin was baptised on the same day as his birth, which is clearly shown in the register.[1] Parmentier's mother had received a good education and she, aided by Abbé Daughy who taught religion and the basics of Latin to him and his sister, educated the children herself. But the death of the two youngest children when Antoine-Augustin was eleven affected her health and it was time to start thinking about his professional future: it was necessary for him to have a good job to secure his own future and to contribute to the needs of his family.

When he was thirteen years old in 1750, having sufficient education for entry into the pharmacy profession, he found a job at the pharmacy of Frison at the Place de la Croix Bleue in Mondidier (now Place Parmentier). His job was to carry out galenical and chemical preparations under guidance. He got bed, board and laundry and shared his life with his patron. His lifelong devotion to pharmacy had begun.

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Apprenticeship

Although Parmentier had no particular vocation to become a pharmacist, Frison's right-hand man, Paul-Felix Lendormy, was a distant cousin and friend of the family who in the future would become the patron. He knew Antoine-Augustin and was aware of his need to help his family; he also appreciated his intelligence and his curiosity. Parmentier stayed at Frison's pharmacy for five years and then, at the age of eighteen, made his first trip to Paris with a letter of recommendation in his pocket from Lendormy to his next employer.[2] He was installed in the home of Jean-Antoine Simonnet whose apothecary's shop was in a busy part of Paris, which pleased Parmentier, and he was treated with kindness by the pharmacist, himself from Picardie and possibly related to the Simonnet family.

At that time in the mid-eighteenth century, the time of the enlightenment, there was a scientific explosion, and pharmacy as a science was just beginning. Apothecaries, like spicers and herbalists, were receiving drugs and spices from the Orient and Africa and were ceaselessly battling to receive recognition of the scientific character of their profession. They had begged for, and obtained statutes of incorporation after a long struggle that had begun under the reign of Louis XIV.

At the time of the Sun King a deficiency in the regulations governing poisons came to light; in certain dispensaries anybody could obtain dangerous products. This abuse had been sanctioned by an edict of July 1682 that regulated the movement of toxic products. The position of apothecaries regarding 'miracle cures' which flourished at Court and in certain institutions such as the Hôtel des Invalides was also reinforced. The healing art was all the rage, especially in monasteries and convents where secret concoctions were made.

There was a useful career path for pharmacists that enabled them to accede to the title of 'master pharmacist' (*maître pharmacien*) after serving a four year apprenticeship under a master who himself had had at least six years experience in the dispensary. An accompanying examination comprised a viva lasting three hours during which the candidate had to answer questions from six *guardes de la corporation*, two doctors and six other 'jurors'. Following this was a paper on herbs. The final hurdle consisted of writing five compositions and answering questions from the examiners. If each stage was passed successfully the candidate was invited to take the oath and deposit his tally with the *maîtres de la confrérie* after which the new pharmacist could be installed. However, a rule prevented him for five years from opening a business close to the dispensary where he had trained. There were further rules governing widows or young children taking over the business from their spouse or father. Although apparently reasonable, these rules actually placed a constraint scarcely noticed by the pharmacists: the permanent guardianship of the doctors. Since the 13th century royal command had placed pharmacists under the authority of the doctors, so that pharmacists had to content themselves with dispensing prescriptions under their supervision. Like his fellows on entering the profession Parmentier was an impotent witness; in the second half of the century he would become a vital man of action. By the end of 1756 Antoine-Augustin Parmentier had worked for a year at the dispensary at the Croix-des-Petits-Champs. His seriousness, care and precision plus his passion for work impressed Simonnet: the young man from Picardie had the makings of a great pharmacist. But these gifts were not enough. To achieve their goal, luck and protection at Court were needed, which is why among the apprentices the children of master pharmacists or of the rich bourgeoisie were the ones to open their own dispensaries. Consequently, in order to canvass for their status as master the apprentice had to undertake all manner of obligations. He had to tip the jurors and himself buy the plants, powders and liquors needed for the final examination. Then he had to buy meals for all the jurors and food for the doctors and apothecaries who were his judges, or dinner during the preparation for the final examination, which could last several days. A final and considerable expense was for the successful candidate to provide a reception and a dinner to which the jurors, the local aldermen, master pharmacists, doctors and their wives were all invited.

These regulations and customs were insurmountable for many apprentices, and if too poor to take and pass their final examinations, they had to spend the rest of their lives serving their patron. Subjects of contempt and condescension, they were known as 'master-valets'. This is what lay in wait for Parmentier. When he entered apprenticeship in Montdidier it was primarily to lighten the financial load on his family, but he had reached a stage where he knew he could not afford to finance his studies in Paris. This was nothing new to Simonnet who had himself undergone similar difficulties. Nor was he unaware that his protégé would have to take a different road. In his youth he had been an *aide apothicaire* at the Hôtel Royale des Invalides. He had remained on good terms with the military and had kept himself informed about what was going on in the army health corps. Simonnet was convinced that it was there that the future lay for Parmentier; he knew that Antoine-Augustin could not afford to complete his apprenticeship and take the examinations and realised that the preparations for a military expedition (what became known as the Seven Years War) enabled him to give the young man from Picardie a nudge in the right direction.

Soldier

Although apothecaries had been officially admitted into the army from January 1747, ten years later they were still not fully integrated. Originally providers, then examiners, of drugs, by 1757 they were dispensers of familiar remedies but still under the orders of the doctors. Recruitment was poor and early in 1757 at the beginning of the Seven Years War there were insufficient numbers.

When Simonnet suggested that he seize this opportunity to progress by joining the army, Parmentier

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was twenty years old. There is no evidence that he hesitated even though he knew nothing of military life. There was only one hurdle: to pass before an examiner who selected boy pharmacists. Parmentier's examiner was Louis-Claude Cadet de Gassicourt who was known to Simonnet as he was *apothicaire major* at the *Invalides* during a time when Parmentier's patron was probably there.

Cadet, who would later become a familiar of Parmentier, was the third of thirteen children of the surgeon Claude Cadet. When he met Parmentier Louis-Claude was himself only twenty-six but energetic and enthusiastic. The passion, will and expertise of Antoine-Augustin impressed him and he was soon assigned to the army at Hanover as pharmacist 3rd class.

Parmentier was twenty when he joined the army; he never left it and fifty-six years later when he died he was still a soldier, probably the longest-serving soldier ever in the French army.

The war had begun a year before Parmentier joined up with a brilliant expedition to Minorca where the English were routed. This venture revealed the talent and ingenuity of one of the pharmacists, Pierre Bayen, who had been recommended by the head doctor in Richelieu's army, François Imbert*. Rejoining Imbert at Marseille, Bayen immediately began to assemble the drugs needed for a mobile hospital. He returned to Minorca and with his reputation still fresh he was sent to Germany in 1757 with the rank of Chief Apothecary. He discovered there that the health services were totally disorganised.[3] After signing a new treaty with Austria, Louis XV sent two armies to Germany, one of 24,000 men under Prince Soubise, a friend of the king, and the other of 70,000, which included Parmentier, and this latter, under the command of Marshall Estrées, had as its goal the crossing of the River Weser and invading Hanover, then a territory ruled over by George II of England. Camped on the wide plains the army quickly ran out of provisions and troops began to die of hunger. Parmentier was relatively lucky as stationed in Hanover he was embroiled with the sick and injured in the annexes of the King of England's palace, transformed into a military hospital. But this was only a brief respite from the slow advance to meet up with the other army. Frederick II was on the look-out, aware of his numerical inferiority; the King of Prussia knew that he had to move quickly to exploit the weakness of the enemy. He seized his chance on 5 November 1757 at Rossbach near Leipzig where he deceived the army of Soubise and that of Saxe-Hildburghausen.

It is commonly believed that Parmentier and Bayen were taken prisoner at Rossbach but there is no textual evidence for this, particularly as Bayen destroyed his papers during the Terror and Parmentier described his campaign only to his colleagues in the *Bulletin de Pharmacie*, which first appeared on 1 January 1809. But it was after Rossbach that the destinies of the two pharmacists were linked. The day following the defeat at Rossbach Bayen's assessment of the situation revealed catastrophe. The services were decimated, provisions were non-existent, entire regiments were down with dysentery, the wounded on the way to hospital were dying with their horses and the number of resignations and the number of apothecaries still at work were not clear.

Totally discredited, Richelieu gave up his command in favour of the Count of Clermont who hurriedly wrote to the king that he found the army divided into three: the first third, above ground, he said, was composed of thieves and ragged from head to foot, the second was below ground and the third were in hospital. Clermont clearly had a talent for laconic reportage, if for little else. His first task was to re-establish discipline and, being inexperienced, appointed three Lieutenant Generals as advisors, but all three were jealous of him and all three forgot about the enemy. Frederick II took advantage of this godsend and inflicted a total defeat on the French who lost 3,000 men.

In this unbelievable muddle, where the chiefs did not hide their disagreements, where the commissars dreamt only of their profit, where hot water was served as soup to the wounded at the hospital at Wesel, Bayen noticed Parmentier. He had already heard how he had not hesitated to seek out the wounded under fire. His courage and humanity earned him promotion to Pharmacist 2nd Class in January 1758. Bayen knew how he had stopped an epidemic of dysentery that had infected the whole hospital, and he knew also of his indefatigability, his attendance at the bedsides, his support of hospital personnel, his reassuring words of encouragement to the wounded and his reviving the embers of hope among the dying. Everywhere Parmentier went he cared about the conditions of life among the survivors. According to him, hygiene was paramount for the health of the army and recovery rooms had to be kept clean, airy and neither too warm nor too cold.

It has been stated on a number of occasions that Parmentier was taken prisoner five times.[4] Although this may be technically correct, except for the last occasion he was not a prisoner in any meaningful sense. On the first occasion he was inspecting the state of the ambulances and replacing drugs when he was surprised by a group of enemy horsemen who stripped him of his clothes and 'took him prisoner'. He joked later that they took only his money and clothes and then released him. During the course of the war the same thing happened on three further occasions, twice with Bayen; but on the fifth, he was actually incarcerated for two weeks. On several occasions he also suffered minor wounds. In June 1760 he was promoted to pharmacist 1st class, and Bayen was made *pharmacien aide-major.*

Back in France the situation was deteriorating and the public could not understand the alliance between Louis XV and Austria. The king was always in conflict with parliament and the minister who became the strongman of the moment was the Duke of Choiseul who claimed that France had no money, no resources, no sailors, no

* This Richelieu was the great nephew of the cardinal and grandfather of the minister.

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soldiers, no generals and no ministers. His advice was to negotiate peace no matter what the cost. When he became Minister of War in 1761 Choiseul found the army in such a state that he decided on administrative reform and established a corps of inspectors. On 3 February 1761 Piarron de Chamousset was appointed superintendent of army hospitals and his first decision was to recruit health personnel on merit, not by favour. He went to Germany with two assistants, Claude-François Grandelas, sometime doctor to King Stanislas, and Louis-Claude Cadet de Gassicourt who he nominated inspector of pharmacies; Parmentier was surprised to come face to face again with his erstwhile examiner. Chamousset's methods quickly bore fruit, he took total control and the situation improved rapidly. In this environment, enhanced by Cadet de Gassicourt's making contact with scholars from occupied towns, Parmentier flourished and turned his attention to a study of the chemistry of food. Chamousset came from two grand families and when his father died in 1737, the year of Parmentier's birth, he succeeded him as *maître ordinaire de la Chambre des comptes*, but preferred to consecrate his life to good works. So he resigned in favour of his younger brother and, having a knowledge of pharmacy, medicine and surgery, opened a hospital where he received no fewer than two hundred patients a day.

Balland pointed out that Parmentier met two worthy men in the army, Bayen and Chamousset. He quotes Parmentier: 'His [Chamousset's] house could have been called the temple of benevolence.' Bayen, who was a kind of mentor to Parmentier, was an inspector pharmacist who worked also with Lavoisier. Such was Parmentier's respect for him that when, much later, he was nominated a member of the council of physicians in preference to Bayen, he refused.[5] Chamousset left his job in April 1762 leaving in Choiseul's hands a manual for military hospitals, while Cadet de Gassicourt was sent to Spain as *apothicaire-major* for the army. In Germany there was an end to hostilities.

At just this time Parmentier was taken prisoner for the fifth time but on this occasion no exchange was foreseen and he wallowed for two weeks in a dungeon with only a sort of potato gruel for meals. This frugal diet was to prove an important stimulus in his later work and something of a turning point in future French cuisine. Then conditions improved and he became a prisoner of war with conditional liberty, authorised to work in a pharmacy in Frankfurt. It was here that he came across Meyer, a chemist-pharmacist who researched the chemistry of food.

Not only did the two men get on famously but Antoine-Augustin was not unaware of the charms of the daughter of the house. He improved his German, which he had randomly picked up in the camps. Meyer was so impressed with the young Frenchman's personality and competence that he offered his daughter in marriage together with his laboratory and Prussian nationality as dowry. Parmentier declined all three gifts, on the basis of his patriotism. Meyer's daughter's views are not recorded.

Meyer was not convinced by Parmentier's refusal and determined to return to the subject, but he was soon to be astonished by a proposition by the great Alembert: he proposed that the young Parmentier replace the chemist Margraff in Berlin who was going to retire as a pharmacist-in-chief to the Prussian army. That proposition surpassed all understanding. For Meyer, refusing such an offer was unthinkable, but not for Parmentier. So Meyer lost the son-in-law of his dreams and now he would have only the memory of an exceptional pharmacist with a great future ahead of him.

Peace

The war was formally ended on 10 February 1763 by the Treaty of Paris and Parmentier was sent back to France with a small sum in his pocket and an uncertain future. He was twenty-six. Most of the pharmacists who had signed up for the army at the end of hostilities were returned to civilian life. There was no question of his returning to Simonnet, who had no place for a pharmacist First Class. As to Bayen, he took a job near the Spanish border where the Secretary of State for War instructed him to analyse the waters. From time to time he returned to Paris where he lived in a boarding house and it was there that he would meet his old army comrades. He often saw Parmentier and Chamousset there and it was these friendly discussions and encouragement that led Parmentier to continue his studies before seeking another job.

So as a pharmacist First Class, with little more than a reputation for his competence and humanity, he took courses in botany with Bernard de Jussieu and studied chemistry with the brilliant Rouelle whose legendary blundering enhanced meetings at the Academy of Science. In this milieu he bumped into Jean Darcet, sometimes met Cadet de Vaux, the younger brother of Gassicourt. And he also came across the young Antoine-Laurent Lavoisier.

With the money he had brought back from the war fast running out, Parmentier took a job in the apothecary's shop of Bernard Laccreu, a friend of Rouelle, at the rue des Petits-Champs, close to Simonnet. He stayed only for a short time as he heard from Chamousset and Bayen that the position of *apothicaire major gagnant maîtrise* at the Invalides would soon become available by examination. This was rather revolutionary since hitherto the medical corps of that institution recruited by co-option or patronage, or the king himself made the appointment. The change was one of Chamousset's first decisions and one of the first reforms of military administration under the Duke of Choiseul. This new decision was faithful to the prevailing view in the previous century when in 1670 the hospital, which became *L'Hôtel des Invalides Royale*, was first mooted. Louis XIV wanted a building that would receive all soldiers including the maimed and those in declining health, and to avoid the disasters of earlier military hospitals.

Furthermore, the general staff of the hospital, which comprised a physician, a surgeon and a

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pharmacist had been placed entirely under the control of the Daughters of Charity (*Les Filles de la Charité).* Known as the Grey Sisters on account of their habit, they had been installed on 7 March 1676. They were in charge of the pharmacy and prepared all the medicines and purchased all the necessary medicaments.

When he heard that the position of *apothicaire major gagnant maitrise* would soon become available Parmentier presented himself for examination, was well received, and on 16 October 1766 took up his duties at the age of 29, the first Chief Pharmacist to be chosen on merit. The *Hôtel des Invalides* was a miniature town. Within its walls were some 3,000 patients and 500 staff. It had its own clergy, medical personnel, management, bakery, police and administration under the governor who was appointed for life by the king. The entire organisation was run on military lines underpinned by its religious foundation. But it was no ordinary military hospital. It was created to assist old soldiers who were forced into begging or living on church charity. The institution of *Invalides* was created in 1670 and construction was completed in 1676.

To be admitted into the *Invalides* the soldier had to have served for at least twenty years. Furthermore, he had to be unfit for service by reason of age or severe disability due to wounds or incurable illness.

A similar situation existed in England. In 1681 the king issued a Royal Warrant authorising the building of the Royal Hospital. Christopher Wren was commissioned to design the building to be erected in Chelsea, and it was finally completed in 1692.

The appointment was perfect for Parmentier. He could continue his research and his daily routine gave him useful experience. By the time he took up his duties there were 300 beds in six large rooms, four of which were arranged in the form of a cross around an altar, so that the sick could follow the mass from their beds. Unlike in other hospitals, each bed had only one occupant.

Nursing was carried out by thirty-seven Sisters of Charity who also prepared the medication and confections. The responsibilities of the Sisters were clear. They managed the sick rooms in the hospital, the laundry, the care of the sick and they ran the pharmacy. They had a vital role. When Parmentier arrived he could accept the subordination of the apothecary to the orders of the Sister Superior. In the course of six years he set up an acceptable compromise and profited from his enforced leisure.

Parmentier made a daily tour of the hospital and visited the blind, the badly wounded, the one-armed and all incapable of feeding themselves. He examined everything: the rules of hygiene, the quality of the meat served, the way cereals and water were kept, the cleaning with water in the main building, the water outlets in the fifteen courtyards of the hospital where water ran permanently to eliminate the smell of urine, the baths reserved for the sickrooms, the grain stored in heaps, the functioning of the bakery and the temperature of the well water.

In a very short time everyone, from the governor to the pensioners, knew him. They all praised his kindness, his humour, his competence and his enterprising spirit. He mixed freely with the old soldiers and often joined them in the refectory for meals. Some even recognised him from the battlefields of Westphalia as one who had risked his own life to save theirs.

His helpfulness was recognised throughout the hospital. Rather than disturb the doctor or the assistant surgeons it was easier to resolve minor problems in the pharmacy. He could always be found in his laboratory or in the little courtyard where the sisters allowed him to go. Although he worked hard at his job during the day he devoted the nights to his writing. On his return from Germany he was influenced by the repeated years of famine and imposed on himself a humanitarian mission. He wrote later: 'My research has no other goal but the progress of the art, and general good. The feeding of the people is my concern and my wish is to improve the quality and reduce the price [of bread]'.[6]

He covered hundreds of pages with his writing. Under the kind eyes of a few Grey Sisters who played the rôle of his assistants, his research put on a spurt and his first published writing appeared in 1771 and told the story of the friendship between a patient and a sparrow.[7] As mentioned earlier, the Grey Sisters had the governance of the pharmacy at *Invalides* and with it the authority to prepare and administer medicaments from the most simple to the complex. Parmentier found this strange and he was reduced to following the doctor, noting his prescription and placing the order at the Sisters' laboratory. With his civility, modesty and friendliness with everyone, he treated even the Sisters as almost the equals of their director. However, this *bon accord* did not last. He asked the king for permanence at the Invalides and to be chief apothecary. This would end the bizarre situation whereby he, *apothicaire maître*, that is master pharmacist and pharmacist First Class, was operationally subordinate to the Sisters, none of whom was even a qualified pharmacist. The king agreed and he received his brief on 17 July 1772. This was not at all to the Sisters' taste and a battle began between them and Parmentier. They complained to everyone including the bishop and the queen. The king, tired of all this squabbling, withdrew Parmentier's brief on 31 December 1774 but, showing how weak he was, as compensation gave him an annuity and lodging at the *Invalides* for life. This apparent demotion proved the turning point in his career. Relieved of his pharmaceutical duties (he could let the Sisters get on with that), in his own room and small garden he could carry on with much important work, and treatise followed treatise for the next twenty years.[8]

The relative freedom and leisure that Parmentier now enjoyed enabled him not only to write but also to think. And his thoughts led him to conflate two experiences: one was the famines that had frequently plagued France not only in the past but several times in his own short lifetime; the other was his experience as a prisoner of war, when he survived for two weeks on potato gruel

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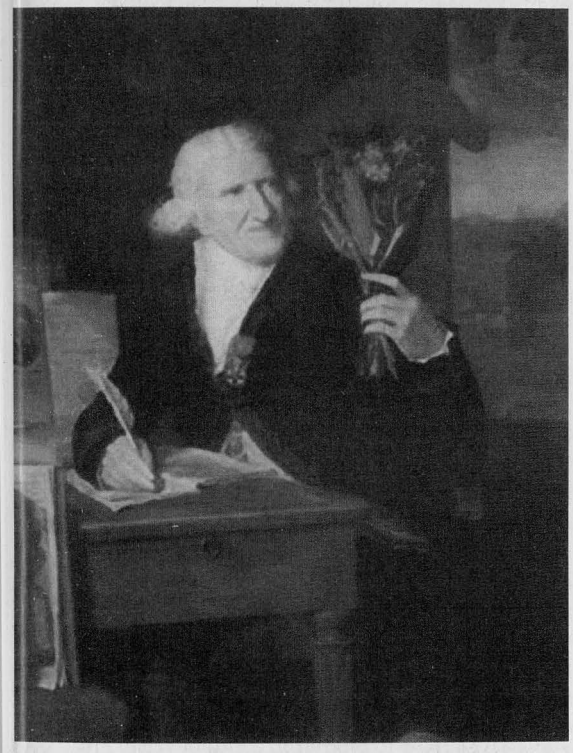
and nothing else. Had the Grey Sisters been more accommodating he might have spent the rest of his life running the *Invalides* pharmacy. Instead, he carried out research into agriculture; he developed ways of making better bread; he wrote pharmacopoeias; he developed potato flour for use in breadmaking; he inspected pharmacies in hospitals and made recommendations for their improvement; and carried out research and inspections all over France at the behest of the government; he wrote more than fifty papers and numerous books. All this whilst he was still a soldier, and eventually chief pharmacist of the French military.

Grain, Flour & Bread

Parmentier knew the value of bread from his youth. When his father's shop was not doing well bread was rationed, and he lacked it during his captivity. In May 1775 he was particularly animated.



The bakers were cheating on their weights and the governor of *Invalides* installed balances in each refectory. Moreover, the bread was too hard, too brown and tasted bad. On his visits the king and the princesses were invited to taste the bread, which often led the administrator of the hospital to be reprimanded.[9]

Parmentier was no longer satisfied with his commission as pharmacist and he undertook work on the use of the potato, improving the quality of bread, and in particular, how grain was stored at *Invalides*. He was sent to Poitou by the Compte de Muy to study the quality of grain and bread. He talked to farmers and bakers and took samples of grain and flour and tasted the bread.

In 1775 wheat in the fields around Montdidier were infected by 'black disease' (*malaise noir*). Parmentier got hold of some of the grain, found a means of cleansing it and wrote a paper *Analyse de la carie de la froment*, which he published in 1776 and was one of his earliest publications.[10]

Parmentier spent the whole of March 1776 back in Montdidier giving a course on baking. By this time he was an established figure: *Pensionnaire du Roi; Maître en Pharmacie de l'Academie Royale des Sciences, Belles Lettres et Arts de Rouen; ancien Apothecaire-Major de l'Armée Saxonne et de l'Hôtel des Invalides*.

Following his journey around France he became aware of the poor quality of bread. He improved methods of milling in a more economic way, and received from Brittany a medal struck to commemorate this philanthropic act. When he returned to Paris he opened a school of baking with himself as director.

By the end of the 1770s the poor lad from Picardie had already come a long way. Apart from his post at *les Invalides* he was pharmacist in chief of the army in Brittany, of the army in Geneva from 1782 and of the army in St Omer from 1788. In his 'civil' life he was deputy-head, and demonstrator in botany at the College of Pharmacy, professor at the School of Baking, government expert in pharmacy, agriculture and the chemistry of food. As an author his output was formidable and his workload ever greater.

His work on grain, flour and bread undoubtedly improved the quality of bread in France beyond recognition and it is possible that the reputation that France enjoys today for the quality, consistency and variety of its bread owes much to Parmentier's work two hundred years ago, although it is not for this that he is remembered. But he also realised what few of his contemporaries did: that no matter how much the quality of flour and bread could be improved, when the wheat crops failed with resulting scarcity (*disette*) or even famine, there would be little or no bread at all for the poor, of any quality. This realisation led to his dominant obsession: how to find a substitute for bread that would adequately nourish the poor when there was no wheat. This resulted in his most innovative work and established his eminence and reputation; but whether it led to his greatest achievement remains to be examined.

Pharmacy

Notwithstanding his growing interest in agriculture Parmentier had not forgotten that he was a pharmacist, and if he had been inclined to forget, his friend and mentor Bayen kept him busy with more and more difficult tasks such as formulating tonic pills for the army and analysing secret remedies proposed for use in military hospitals. He was a frequent visitor to Bayen's laboratory at the rue du Bac for he knew that his friend and master, in attempting to reveal the nature of mercurial precipitates, had found a fallacy in the sacrosanct phlogiston theory of de Stahl. Bayen realized that when oxides of mercury were carefully heated in the absence of carbon they lost weight and

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emitted a gas. Had he gone further and tested the gas with a flame he might have discovered oxygen. The English cleric Priestley and the Swedish pharmacist Scheele both came close to success but it was Lavoisier who on 26 April 1775 revealed the nature of carbonic acid and of oxygen to the Academy of Sciences. What upset Parmentier was that Lavoisier did not refer to the path traced by his friend Bayen even though he knew of Bayen's work. But he knew that Bayen applied the same rule as himself: forget scoffers and dishonest rivals and get back to work as quickly as possible.[11]

Parmentier did not have to go back to work for he seemed to be a man altogether without leisure and for the next twenty-five years he devoted himself to studies on the potato and on bread-making. But at the turn of the century, after producing a book concerned with Eau de Vie and vinegar, and collaborating with three colleagues in writing a massive 585-page tome giving a detailed description of every aspect of wine and vinegar-making from the vines to the vessels used,[12] he turned again to his first love, pharmacy.[13]

In 1803 two pharmacopoeias were published. The first is extremely comprehensive and well laid out and is in two sections with the first section divided into three parts.[14] The first part comprises descriptions of plants and plant products. The second part is concerned with formulations from animal sources, including deer horn, sponge, milk and fish glue. The third part is concerned with formulations of mineral origin such as metals and chemicals.

The second section is devoted to made-up recipes of medicaments with a final few pages of instructions on how to store them. Curiously, Parmentier's name does not appear in this publication but his authorship has been authenticated by Barbier *et al*.[15] It is unlikely, however, that anyone else at that time would have been capable of producing such a comprehensive volume.

In the same year another pharmacopoeia appeared, this time under his own name.[16] This tome of 526 pages is somewhat different from the other, being more practical than descriptive. It is divided into three parts: Materia Medica; Official Medicaments; and Prescriptions.

In an introduction Parmentier points out that there have been a number of pharmacopoeias and that in order to cut down on useless length he has left out items that are available elsewhere and comments that one 'waits patiently for a work that will unite all available knowledge [of pharmacy] ... a pharmacopoeia where all medicaments will be properly evaluated, and which merits being called "*Pharmacopée nationale*" '.

The first pharmacopoeia in French is probably the translation of 'De medicamentorum simplicium delectii' translated as *la pharmacopée qui est la manière de bien choisir et préparer des simples*.[17]

Possibly the first universal pharmacopoeia (though without 'nationale' in its title) was *Pharmacopée raisonnée, ou traité de pharmacie practique et theoretique*.[18] But the earliest publication meeting Parmentier's requirements was *Codex, pharmacopée française* published by order of the government commission composed of professors of the faculty of medicine and the School of Pharmacy in Paris (1837).

Conclusions

What can a disinterested and objective posterity conclude about the life and work of Antoine-Augustin Parmentier?

From an early age he showed great diligence towards any activity in which he was engaged. As an apprentice apothecary he aroused the admiration of his apprentice master; as a very young soldier-pharmacist of humble rank he attracted the attention of his superiors by his compassion and hard work. He used his time at the *Hôtel des Invalides* not only to perform his work supremely well but also to widen its scope, to make the residents more comfortable and to enhance the quality of their food and conditions. Throughout his lifelong military career he was promoted to and entrusted with various jobs in his capacity as chief pharmacist and later as inspector-general of he army's health service; he was elected to membership of various departmental agricultural societies and was director of the Royal Society of Agriculture; he founded the school of baking; he founded the *Bulletin of Pharmacy*; he was a founder member and teacher at the School of Pharmacy in Paris; he was appointed an officer of the Legion of Honour by Bonaparte. Throughout his life it seems that all who came into contact with him were charmed by his good nature, compassion and concern for the people.

His job in later life as a pharmacist and later as premier pharmacist to the army would have been a full-time job for most people. But over and above his duties as a military pharmacist he made many important contributions to pharmacy, notably his insistence on a high standard of cleanliness and correct temperatures in hospitals, and the publication of two pharmacopoeias, the quality and comprehensiveness of which cannot be over-rated.

He was very interested in and concerned about the quality of bread and its availability for poor people. He studied the subject closely and wrote copiously on various types of grain, their cultivation, diseases to which they were prone, their harvesting and milling. He redesigned flour mills and ovens and showed how they could be run with greater economy. Using the bakery at *Les Invalides* he experimented with various grains and flours so as to obtain the highest quality of bread with most nourishment and the best flavour. It is possible that the high quality and great variety in bread available in France today owes much to Parmentier's early work.

He was one of Europe's first true agronomists. He was fascinated with agriculture and made many studies of vegetation used as food. He was very aware that the frequent famines were due to failures of the wheat harvest, mostly due to bad weather, and he desperately wanted other sources of food to be available. These interests led him into early attempts at food analysis;[20] his work was meticulous, painstaking and scrupulously recorded. He also investigated such diverse foodstuffs as sugar, wine, grape syrup, beet sugar, milk and water.

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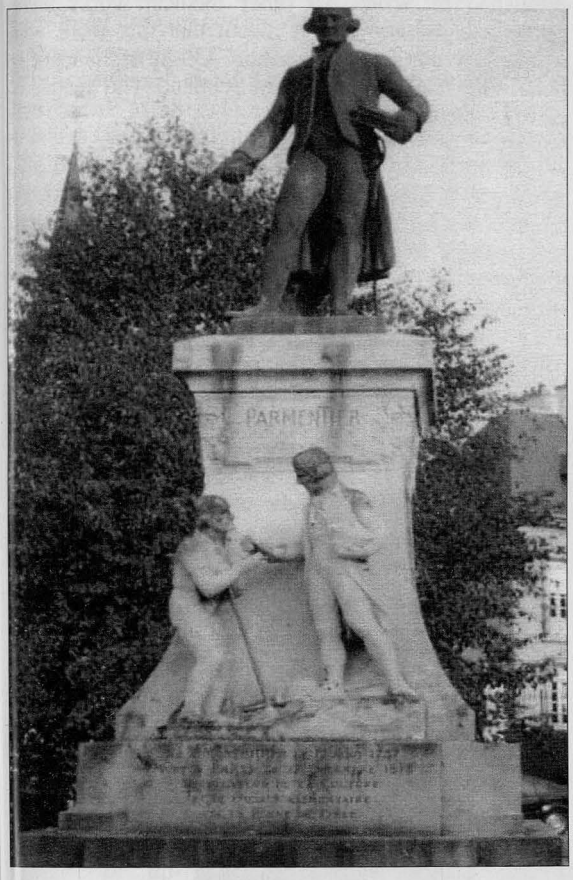
From 1771 he wrote continually; from then until his death he published fifty-three items, many of them scientific or agricultural papers but in addition, a substantial number of, often, very long books. A number of unpublished works were also found after his death.



Statue of Parmentier at Montdidier

In addition to a workload and output that would have occupied several other people the *leitmotif* of his life for which he is remembered above all else was his work on the potato. From his days in the army in Germany he had considered that potatoes were a useful source of food, particularly in times of famine or scarcity, despite the great prejudice against them throughout most of France. He was successful in cultivating them himself, after persuading the king to let him use a large plot of land outside Paris for the purpose. He attempted to analyse them and got a number of things wrong, but this is hardly surprising given the level of chemical knowledge at the time. This led him to assert that potatoes were more nutritious than they actually are. It would have been simpler to persuade people to eat potatoes as he himself had, in broth, boiled, baked, as an accompaniment to meat or with salt and lard. But his aim was to use potatoes to make bread. Whether this became merely an obsession or whether he felt instinctively that the French public were such zealous bread-eaters that the only way he could get them to eat potatoes would be to incorporate them into bread is not known, but he (and others) experimented with the idea and he published in great detail a method for making bread using potatoes wholly or partially in place of flour.

Much has been made of Parmentier as the *inventeur* (inventor) or more accurately the *vulgarisateur* (populariser) of the potato, and outside historical circles it is his name alone that is known in this context. He was certainly not the first. Duhamel du Monceau and Mustel[19] each have an earlier claim than Parmentier, even in the making of bread from potatoes. But Duhamel du Monceau and Mustel did a little work on the potato, each published a paper and went on to do something else. Parmentier worked on various aspects of the potato and its use in breadmaking, refining and publishing his results until the topic was exhausted. The use of potatoes in the making of bread never really caught on, partly because it is still a fairly time-consuming procedure and because by the time knowledge of the method became widely known, wheat and maize grown elsewhere were able to be transported to where they were needed. Sadly, potatoes did not have much impact on the effects of famine and fortunately by1800 famines in France became rare.

Parmentier was not always right, not always relevant and not always even first, but his many accomplishments made a real difference to many people in many fields. For his outstanding contributions to pharmacy, agriculture, nutrition and chemistry – together with his humanitarian and benevolent approach to society – he must surely be included among the great Frenchmen of the eighteenth and early nineteenth centuries.

Author's address: bpb33@tiscali.co.uk

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Ane Breve Description of the Pest

Dr Peter M Worling
Edinburgh

The plague, known in Scotland as the Pest and sometimes as the Black Death, first occurred in China in the 1330s. At that time China was a world-wide trading nation. By 1347 ships from Europe arrived in the Black Sea where they linked with the China trade and carried the disease to Sicily and then on to the rest of Europe. There was a mortality rate of between 25 and 40%, which reduced the European population and had far reaching economic influences.

The disease reached England in 1348 through the port of Southampton and lasted until 1350. There were further outbreaks in 1361-1362, mostly affecting the young, in 1369 when some 13% of the gentry and clergy in England died and also in 1379-1383 and 1389-1393. By the 15th Century the disease had become endemic, with its centre in the middle of Europe, and cases continued to occur. Consequently when Gilbert Skeyne published his work there was a considerable amount of knowledge about the appearance and effects of the plague.

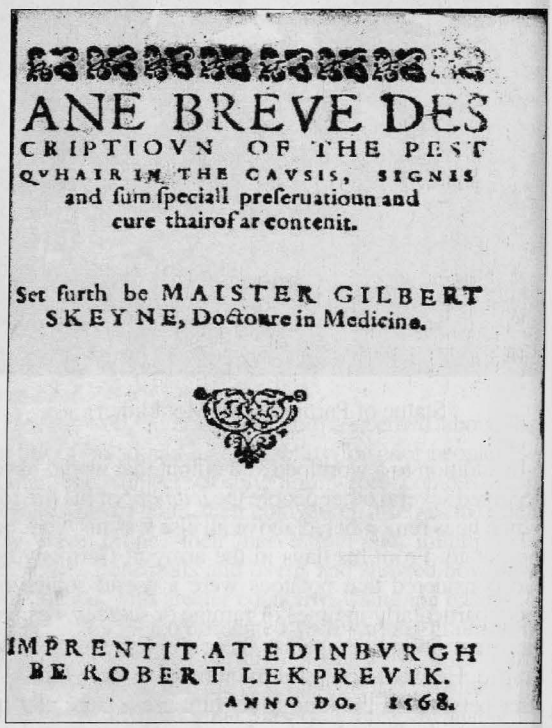
Gilbert Skeyne was born around 1522 in Aberdeen, Scotland. He was educated at the Grammar School and at Kings College, Aberdeen University, where he gained a Master of Arts degree. He then went on to study medicine and in 1556 he was appointed Mediciner (that is a Doctor) at the University. It was during his time at the University that his treatise on the plague was published in 1568. He is known to have published one other work in 1580, '*Ane brief description of the qualities and effects of the well of the Woman Hill beside Abirdene*'.

In 1569 Gilbert married Agnes Lawson, the widow of an Edinburgh Burgess, and in 1575 he moved to Edinburgh and set up a medical practice in a house in Niddrie Wynd. His practice prospered and he became well known locally. On the 16th June 1581 he was appointed a physician to King James VI and he was granted a pension of £200 Scots. He died in 1599.

His treatise is particularly interesting because it gives us an insight into both the philosophy of medicine, as well as the drugs in use at the time. It is written in Middle Scots and it is the first medical treatise published in Scots. All other medical works were published in Latin and it meant that this work was available to a much wider public. A copy of the work is held in the National Library of Scotland. The treatise is divided into eight chapters:

Chapter	1	A Description of the Plague
	2	The Causes of the Plague
	3	Signs
	4	The Most Dangerous Places to Be
	5	Recognition of the Infection
	6	Signs of Death
	7	Prevention of Plague
	8	Cure.

The last two chapters are the main sections, giving instructions on how to treat the patient together with many prescriptions which he recommends. While the body of the text is in Scots the prescriptions are in Latin.


ANE BREVE DES
CRIPTIOVN OF THE PEST
QVHAIR IN THE CAVSIS, SIGNIS
and ſum ſpeciall preſeruatioun and
cure thairof ar contenit.

Set furth be MAISTER GILBERT
SKEYNE, Doctoure in Medicine.

IMPRENTIT AT EDINBVRGH
BE ROBERT LEKPREVIK.
ANNO DO. 1568.

Title page of *Ane brief description of the pest*

Europe at that time was strongly influenced by the church and religious belief. It is not surprising that the first cause of the plague is seen as a scourge and punishment of the most just God, so that heaven which is the admirable instrument of God, blows that contagion upon the face of the Earth.

Gilbert then continues by listing the secondary causes of the plague:

> The cause of the plague in a city is the stink and corruption and filth which occupies the common streets and gutters, the

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great reek of colis(smoke from coal) without the wind to despatch the same, corruption of herbs sic as Cail and growand treis (trees), moist hevie sauer (smell) of lint, hemp, and ledder (leather) stepit (soaked) in water. Ane privat house infectis other of stink and closetis (toilets) or corrupt carioun (dead animals) therein of near by if the inhabitant's hes inviseit (visited) other infected townis or drinking corrupt water.

There was consequently a clear understanding that the filthy conditions in which people lived in the cities contributed to ill health and the spread of plague, although they did not know how the infection was spread.

In chapter 3 Gilbert describes the physical conditions most likely to bring about an epidemic. He believes that these include a wet spring, the eclipse of the sun, meteor showers and following the sickness in poultry. He emphasises the influence of bad weather conditions, but shows in his remarks that, at that time, there was little understanding of how the infection was spread.

Gilbert describes in chapter 4 those places where the plague is most likely to occur and those most likely to succumb. The places are those near the sea, situated towards the South and where there is an abundance ofstanding water and where dead are buried. As the plague epidemics generally started in Continental Europe and the infection was carried to the ports in the South of England and Scotland before travelling up through England to Scotland, this confirms his observation that the disease travelled from the South.

The next two chapters deal with the diagnosis of the plague and the signs of death. He describes the plague symptoms as a high fever, headache, depression, pain in the stomach and the heart, coupled with heavy intakes of breath. He describes the appearance of the swellings, which he calls 'BUBONES' of the lymph glands under the arms and in the groin, and remarks that if a number appear it is considered more deadly.

Signs of impending death are given as abdominal cramp and pain, the body being covered with red spots – which turn black, (thus the name the Black Death)` , refusal of food, a black tongue and a dry mouth. He comments that he treats his patients with the help of God who is the only true mediciner for the body and the soul. He ends by explaining that he has of necessity to write his prescriptions in Latin as they cannot be easily translated into the vulgar language. This may make these obscure for the unlearned reader but he can obtain any of these prescriptions from the apothecary prepared with all good faith and diligence, as they are prescribed with benevolence.

Chapters 7 and 8, which are the main chapters, deal with the preservation (prevention) and cure of the plague. He recommends two actions: the first is to prepare the body 'for purging of the superfluidity or corruption of humours'. Evacuation is then recommended before or after anyone has been in a suspect place by drawing blood from the median vein of the right arm taking a quantity that is determined by the strength, temperament, constitution and the age of the patient.

He makes the point that man must live in a fresh atmosphere and where there is stink and corruption it must be dealt with by fire and fumigation with aromatic materials. He quotes Hippocrates who lit fires in Athens to combat the plague brought over from Africa and Ethiopia on the prevailing wind. He gives a long list of materials to use in fumigation:

> A fire is first made of fir or a similar timber and added to it various herbs such as Aloes, Callamus called Aromaticall, (Calamus rotang – dragons blood), Asarum, the scruff of Citroun, Saifroun, (*Crocus sativa*), Canel Cypir, Coste, Galange, (possibly *Kaempferia galangal*), Caryophillis (Clove), the tre and Granis of Iuniper, Rosemarie, leavage (lovage), Balme tre, Laure tre, Squinathe calles Iuncus odoratus, Ladanú, myrrhe, Minte, Origanum, the root of Valeriane, Pulege, Saige, Sauine, Tamarisce, Rosait, Acorus (*Acorus calamus*), Aspic, Basilic, Tyme, Calamint, Mariolane, Finkill, Hysop or others of such quality as the time shall require such as hot and dry in winter, cold and humid in summer.

He also says that these ingredients can be used to make compositions in the form of lozenges, thick powders, candles or 'pomis odorative'. He gives a number of prescriptions for these, for example:

R Yrios Florentine
Majoranae
Calami aromatici
Lapdani
Benioni
Cpri gariophillorum cuisop drach duas
Moschi grana quatuor

Fiat pulvuis gum traganti; quátú sufficere posse artifice videtur;

praescripta in massae formam temperet, fomenter deinde pilae suffisimi odoris qui principi pestis causae ex diametro repugnant.

He suggests the use of sheets soaked in vinegar as hangings, dipping a sponge in vinegar in which rue has been soaked, and other remedies but he points out that these are not as efficient as the preservative remedies he recommends.

There are many other prescriptions recommended in the chapter, some for use in the winter, others in summer. An interesting suggestion is that those patients that do not know with which disease they are infected should take a drachm of Pill Aggregative followed the next day by a dram of Theriac. However, he says, these days Theriac is not well dispensed and not good and two drachms of the following electuary could be taken instead:

R Ros siccaru rad gentianae
Squináthi,
Trifolii
Thuris, sing drachma duas.
Sanquinis sicci anseris
Haedi

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Anatis maris et feminae
Rutae sylvestris feminis
Fenicoli, Cumini, Anethi,
Napi sylvestris vel rapi hortensis cuisop drachmem
Et feminis----------
Myrrhe
Nardi sing drachmas tres
Piperis albi et longi:
Costi, phu, cinamomi, anisi sing drachmam
Benzoi, afari, ámoniaci cuisop drachma et semis
Ireos, croci, rhei, gigib, Mistiches sing drach. Semis.
Stoecados drach tres
Agarici, mari, ana drachma
Carpobalsami grana numero viginti
Fiat pulvis tenuissimus ex omnibus.
Mix with four parts of honey, well mixed and pour into a silver vessel, as a most precious medicine, which not only preserves from the pest but is also good for curing the same and is an antidote for all other poisons or bite of serpent.

A prescription he recommends for older people or those with a humid temperament:

R Castorei veri
Aristolochia rotundae sing drachma duas
Gebtianae drachma
Baccharus lauri drach
Ex omnibus fiat pulvus, ane drachma thereof as age and nature of the resauer (patient) requires with wine or some convenient liquid once daily for prevention and twice daily for cure.

The final chapter eight is headed 'Cure of the Pest'. Gilbert begins by recommending the patient is given a good fat fowl with two fresh eggs and three ounces of 'rosate' honey. This is followed with a dose of the 'antidote cordial' (because the venom to the most part draws to the hart). The vital faculties must be carefully observed and the patient should be allowed to rest. If there is deterioration then give the following prescription:

R theriace optimae septem ad minus annod
Optima venetii tantú,
eao legitima cõfictus
boli Armenan
diarrhodi abbayis sing drac una
rheib electi drac semis
cinnnamomi opti unciae semis
trochiscorú de spodio
triu sand loru
terrae sigillatae
et camphorae recentis fin
serupulu sacchari ros et bugloss ros
enuity --- croci orientalis scrupuli semis
in pulverem quae debent iatricú vertantur, qui in aquis cardui benedicti, scabiosae, buglossae, rosarú et plantaginis sing unc. semis quae tandé colata, per manicam Hippocratis ferantur, fiat antid. capiat infirmus unâ , vel tres uncias vt ratio postulat singulis matutinis horis, noctis hora media.
Within three hours of taking this antidote if any aposteme (lump) appears, affix a 'ventose' there, if it does not appear fix the same to the ears, under the oxter (arm pit) and by the secret members. Draw blood from the arm copiously, if the patient can suffer this. If swelling appears on the head, open the cephalic vein on the exterior part of the arm, if between the head and the secret members Leuer vein on the inner part of the arm, if beneath the secrets the interior vein of the foot called saphena must be opened.

Following bleeding he recommends a number of prescriptions which can be used, for example:

R aloes electe unc. duas
aristolochiae rot uncia
croci drac. semis
tormétilae
dictani sesquidrachma
semisacetose
seminis pomtrei ana drac seminis
rheib drach duas
salisimae spicae sing drachmam
cú serapio de acido ori succo
In globú redigátur pro pilulis
Ane sufficient dose to be taken twice or thrice for prevention or at the beginning of infection.

He recommends that the patient should be kept quiet in a room with a big fire and vinegar and rose water thrown on the fire. He gives a prescription for a hot application for the chest. He recommends that the patient should abstain from sleep the first night but as frequent sickness and fainting will make it difficult to retain the medicine he suggests that the stomach can be settled by giving a prescription which includes olei ros and myrrh.

On the second day he reports that Avicenna gave two ounces of rose water, an ounce of small white wine and bol armen in powder. If the patient retains this he may be safe but if he vomits it is a deadly sign. The third day he is given a drachm of the previous antidote and any swelling, fomented with a decoction of the root of lilies althe, camomile, anete and adiante fixed in a cataplasma of flour and fresh butter. He also discusses the best way to deal with the swellings; he recommends they should be opened by a surgeon because of the infectious material contained in them.

There are many other prescriptions. In only one is aquae vitae mentioned and this is in a prescription to be given to aid recovery after the plague has subsided. From these prescriptions we can get some idea of the more popular treatments. There is an emphasis on the use of Theriac with a multitude of ingredients. Items frequently used are aloes, myrrh, honey, Armenian bole, rosae rubrae (the fresh dried petals of *Rosa gallica*), oil of roses, cinnamon, camphor, flowers of violets, bugloss, aristolochia, scabious, gentian and vinegar, together with many other herbs, most of which are familiar to us today. Among the more unusual ingredients he mentions are oil of scorpions and vipers. It is significant that while he recommends purging and bleeding his pharmacopoeia is largely a herbal one and he does not use the more esoteric remedies that have been reported by some other authors at this time.

Author's address: p.worling@virgin.net

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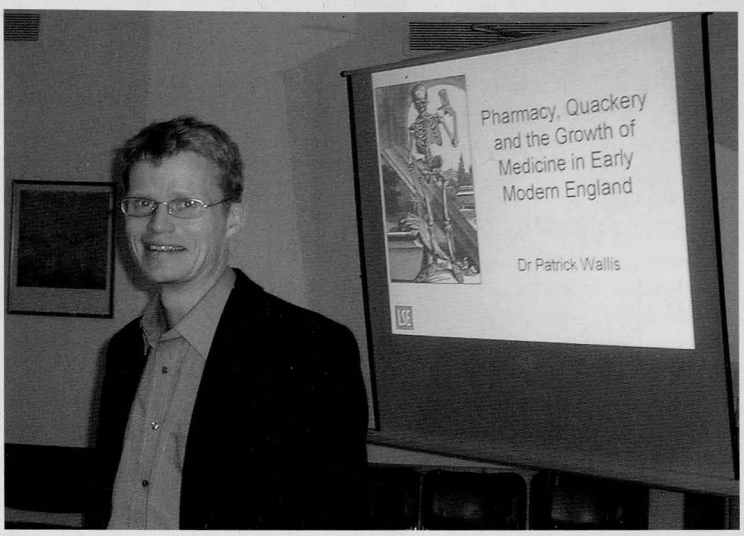

Dr Patrick Wallis, who spoke about 'Pharmacy, Quackery and the Growth of Medicine in Early Modern England' at the BSHP meeting in November 2007

Major Accessions to Repositories in 2006 Relating to Pharmacy and Chemistry

This annual digest collects information from over two hundred record repositories throughout the British Isles about manuscript accessions received in the previous twelve months. They are available in full on The National Archives' website (www.nationalarchives.gov.uk). The indexes of the National Register of Archives can be consulted at the National Archives, Kew, Richmond, TW9 4DU or online.

Local

Bristol Record Office, 'B' Bond Warehouse, Smeaton Road, Bristol BS1 6XN. Henry Hodder & Co Ltd, chemists, Bristol: prescription books 1911-1931 (43274)

Derbyshire Record Office, New Street, Matlock, Derbyshire DE4 3AG. Finlay McKinlay, wholesale and retail chemists, Glossop: business records 1929-1952 (D6622)

East Sussex Record Office, The Maltings, Castle Precincts, Lewes, East Sussex BN7 1YT. Chemist, Eastbourne: prescription book 1961-64 (ACC 9407); Chemist, Hove: prescription ledgers 1936-49 (ACC 9507)

Essex Record Office, Wharf Road, Chelmsford, Essex CM2 6YT. A & D Cameron, pharmacists, Braintree: recipe and prescription books 19th cent-20th cent (D/F 294)

Glamorgan Record Office, Glamorgan Building, King Edward VII Avenue, Cathays Park, Cardiff, Glamorgan CF10 3NE. Robert Drane, chemist, Cardiff: additional records 1849-1916 (D206)

Kingston Museum and Heritage Service, North Kingston Centre, Richmond Road, Kingston-upon-Thames KT2 5PE. Thames Valley Pharmacists Association: records incl minutes c1903-1999 (KX431)

North Devon Record Office, North Devon Library and Record Office, Tuly Street, Barnstaple, Devon EX31 1EL. AH Cox & Co, pharmaceuticals manufacturer, Barnstaple: sales ledger 1938-1960 (B850); EW Proudman, pharmacist, Barnstaple: recipe and veterinary scrapbook 1930 (B832)

North Yorkshire County Record Office, Malpas Road, Northallerton, North Yorkshire DL7 8TB. Chemist, Knaresborough: prescriptions book 19th cent-20th cent (ZKA)

Nottinghamshire Archives, County House, Castle Meadow Road, Nottingham NG2 1AG. Cherrington & Sons Ltd, chemists, Newark: prescription, recipe and day books 1846-1993 (7073)

Plymouth and West Devon Record Office, Unit 3, Clare Place, Plymouth, Devon PL4 0JW. Samuel Ley Ash, druggist, Plymouth: bank book 1868-1892 (Acc 3211)

Powys County Archives Office, County Hall, Llandrindod Wells, Powys LD1 5LG. WW Johnson, chemist, Llandrindod Wells: prescription book 1860-1987 (R/DB)

Sheffield Archives, 52 Shoreham Street, Sheffield S1 4SP. J Preston, chemist, Sheffield: prescription ledgers 1894-1974 (X65)

Suffolk Record Office, Bury St Edmunds Branch, 77 Raingate Street, Bury St Edmunds, Suffolk IP33 2AR. Boots The Chemist, Newmarket: prescription registers 1897-1974 (HC578)

Surrey History Centre, 130 Goldsworth Road, Woking, Surrey GU21 6ND. Tutte family, chemists, of Epsom: notebook of medicinal recipes and household advice 1832-44 (7900)

Special

Wellcome Library, Archives and Manuscripts Section, 183 Euston Road, London NW1 2BE. Jonathan Pereira, pharmacologist: letters 1833-1850 (MS.8451); Charles Charnley, chemist and druggist, Wilmslow: recipe books 19th cent-20th cent (MSS.8437-8438)

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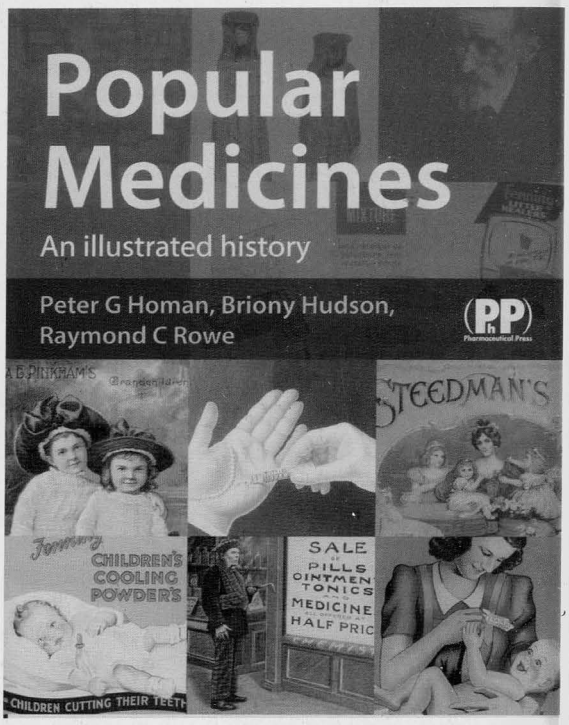
Review

Popular Medicines: An illustrated history

Homan, Peter G; Hudson, Briony; Rowe, Raymond C. London: Pharmaceutical Press, 2008, pp 182 and viii. ISBN 978 0 85369 782 2. Price £24.95.



This colourful book is likely to provoke nostalgia in anyone concerned with pharmacy and its products over the last 50 years. There are chapters for 21 popular branded medicines that were introduced and widely advertised, some over more than 300 years, and a handful are still in use. Many have declined in popularity since the Medicines Act 1968 and its licensing requirements and a general reduction in the use of harmful ingredients.

Looking at these popular medicines with hindsight, the range of activity of what were little more than laxatives or purgatives is incredible and a testament to the power of large advertising budgets to influence the gullibility of a medically ignorant population. Though the medicines were disdained by the medical profession and many pharmacists (who preferred to make their own nostrums), were orthodox medicines much better? Many of the products were criticised or denounced as worthless in their time, not least by the BMA's *Secret Remedies* investigations,but most remained popular with the public.

The main theme running through the oral products is purifying the blood, the liver and the body generally. The claims evoke today's advertisements for 'holistic detoxing', colonic irrigation and spa treatments. The analytical results produced in the 19th and early 20th century contain many unknowns and would benefit from re-analysis by today's super-sensitive methods. However, ingredients were frequently changed over time.

Many of us will have taken these remedies in the past. I was given Golden Eye Ointment (mercuric oxide), and Steedman's Soothing Powders for teething in the days when it contained calomel. Some of the products, such as Singleton's Eye Ointment (Golden Eye Ointment) and Woodward's Gripe Water, could still be considered effective, even if not sterile or suitably packed. Others caused numerous deaths over the years from use in children or enthusiastic overdosage. Products containing opium and antimony could be particularly dangerous.

The text is lavishly illustrated with colour pictures of the originators, the products, their labels, advertisements and many interesting promotional leaflets, mostly from the invaluable collections of the Pharmaceutical Society's Museum. The authors are experienced in their fields and are to be congratulated on bringing these medicines back to life. The chapters on products from Anderson's Scots Pills to Zam-Buk have a consistent structure that describes: the inventor and origins of each product, often with quotations from advertisements and contemporary reviews; the formulas and how they varied and were copied over time; the claimed uses; ownership of the remedy from its origins to recent years. The fascinating histories of the products and the fortunes some of them produced are well researched. Several products have musical connections, from the well known music produced by Beecham's (*Hark the herald angels sing, Beechams Pills are just the thing*), through Bile Beans and Lydia E Pinkham's Vegetable Compound (*Lily the Pink*), to Elgar's Mrs Winslow's Soothing Syrup. Besides those already mentioned there are chapters on Burgess Lion Ointment, Carter's Little Liver Pills, Clarke's Blood Mixture, J Collis Browne's Chlorodyne, Dalby's Carminative, Fennings' Children's Cooling Powders, Holloway's Pills and Ointments, Dr James's Fever Powders, Morison's Pills, Mother Seigel's Syrup, Poor Man's Friend Ointment, and Dr William's Pink Pills.

The book was an informative read where the illustrations were as interesting as the text, and it should appeal to anyone who has worked in a pharmacy or is interested in medical, social and pharmaceutical history. I would also commend it to the general public, who over the centuries have kept these medicines in business. **Ainley Wade**

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British Society for the History of Pharmacy

840 Melton Road, Thurmaston, Leicester, LE4 8BN
Tel: 0116 264 0083, Fax: 0116 264 0141, Email: bshp@associactionenterprises.com

The British Society for the History of Pharmacy was formed in 1967 under the aegis of the Pharmaceutical Society of Great Britain, having originated from its History of Pharmacy Committee.
BSHP seeks to act as a focus for the development of all areas of the history of Pharmacy, from the works of the ancient apothecary to today's ever changing role of the community, hospital, wholesale or industrial pharmacist.

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Promotion of historical studies related to pharmacy.
Advancement of knowledge and propagation of understanding of the history of pharmacy.
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Preservation of pharmaceutical artefacts and historic pharmacies.
Support for the work of relevant museums and offering advice on establishment of other pharma-ceutical exhibits and on the preservation of pharmacies.
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The *Pharmaceutical Historian* has been published since 1967, at first intermittently, but on a regular quarterly basis from 1972. Issues generally comprise 16 pages and cover.
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'The History of Allergy and its Treatment' by Prof. Mark Jackson . Lambeth 6.30 p.m.

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Review

Nature's Alchemist. John Parkinson, Herbalist to Charles I

Anna Parkinson. London: Frances Lincoln, Nov 2007, Hardback, pp 336. ISBN: 978-0-7112-2767-5; Price £25.

The title of Anna Parkinson's recent biography of her illustrious ancestor, the botanist-apothecary John Parkinson (1567-1650), sets him perfectly in the context of his day. To describe him as 'Nature's Alchemist' was an inspired conceit, bedded as it is in the 16th-century Paracelsian belief in the act of creation as the work of God as alchemist. A Catholic by religious conviction and family tradition, Parkinson saw God made visible in the natural world around him. As a botanist he sought to discover, identify and classify plants and flowers; as a horticulturist and gardener he endeavoured to grow, nurture and show them, many from seed, both native and from overseas; as a latter-day alchemist he achieved wonders in transmuting existing species and creating new varieties; and as an apothecary he determined their pharmacological value and medicinal virtues and devised recipes for the preparation of drugs and draughts for the benefit of rich and poor alike.

In the literature of alchemy, the alchemical process was often likened to the agricultural cycle of sowing, growing and harvesting, and alchemical thought was characterised by the concepts of progress, growth, improvement and ennoblement.[1] All this was reflected in John Parkinson's two-acre plot at Long Acre in Covent Garden, which in many ways was a precursor to the Society of Apothecaries' physic garden at Chelsea. He spent the greater part of his life toiling tirelessly and patiently away in his 'garden laboratory', applying scientific method to his investigations and experiments, and painstakingly recording the results in what became two hugely important and beautifully illustrated works.

Paradisi in Sole Paradisus Terrestris ('Park in Sun' being a pun on his name), published in English in 1629, was dedicated to Queen Henrietta Maria of France, Charles I's young bride. It was a horticultural treatise on the cultivation of plants generally and was divided into three main sections: the flower, kitchen and orchard gardens. The missing fourth garden, of simples or medicinal herbs, became a stand-alone volume: a

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Bismuth Usage down the Decades

Andrew Hardy[*] and Ragini Vaishnav[**]

[*]Centre for Medical History, School of Humanities and Social Sciences, University of Exeter, UK

[**]College of Medicine, Sultan Qaboos University, Box 35, Al-Khod 123, Sultanate of Oman

Who first discovered elemental bismuth, and exactly when, is unknown. However, the element was being referred to in the late 15th century in Germany by a specialised guild of metal workers.[1] Its compounds have had many uses down the centuries, often as medicines or cosmetics.

The *non*-medicinal/cosmetic uses of bismuth and its salts have varied over time. In December 1896, shortly after the discovery of x-rays, laboratory animals were fed bismuth salts so that the functioning of their intestines could be observed on a fluorescent screen.[2] Prior to this, in the 1860s, the price of bismuth on the UK metal market rose dramatically. This was directly related to a fraudulent method for 'transforming' bismuth and aluminium into silver, perpetrated by the Hungarian refugee Nicholas Papaffy.[3] More recently bismuth has found various uses in metallurgy; by mixing the element with other elements such as lead, tin and cadmium an alloy of low melting point (e.g. of about 70^{O} C) can be obtained.[4] One use of such an alloy is in anti-fire sprinklers - where a water nozzle contained by this alloy becomes free of obstruction if a fire causes its temperature to exceed its melting point.

Bismuth oxychloride (BiOCl) was used as a (white) face cosmetic in the 18th and 19th centuries - often known as 'Pearl Powder' or 'Spanish White'.[5] Apart from the potentially adverse toxic effects of bismuth compounds on human health (see later), there was also the unfortunate tendency of this pearly-white face powder to turn black (Bi_2S_3 being formed) if the user was too close to the sulphurous fumes emitted by the ubiquitous coal fires of the period.

Bismuth compounds have been used in medicine for at least 200 years in the treatment of syphilis/yaws, diarrhoea, indigestion/heartburn, nausea, dysentery, gastric and duodenal ulcers, as suppositories in the treatment of hemorrhoids, in surgical dressings and (externally) as a dusting-powder/ointment for eczema and burns.[6] Comments on the usage and dosage of particular bismuth compounds will be covered later in this article.

The biochemical modification of metals and metalloids such as bismuth via formation of volatile metal hydrides and alkylated species (volatile and involatile) performs a fundamental role in determining the environmental processing of these elements. The formation of such species can increase the environmental mobility of the element, and can result in bio-accumulation in lipophilic environments. The inorganic form of bismuth exhibits low toxicity, however the more lipid-soluble organo-metallic form (which is less characterised) may be highly toxic. Data on the geno-toxicity (and the neurotoxicity) as well as the mechanisms of cellular action of organo-metal(loid) compounds are limited.[7]

Inorganic bismuth salts are poorly soluble in water. Regarding the pharmacokinetic aspects of bismuth, the normal concentration of bismuth in blood is between 1 and 15 μg/L, but absorption from oral preparations can produce a significant rise. Distribution of bismuth to various parts of the body does not depend on the compound or on the route of administration. The concentration and retention of bismuth is highest in the kidney where it is bound to a bismuth-metal binding protein. In addition to the renal route it is also excreted by the faecal route.

In humans, toxic effects of bismuth compounds include nephropathy, encephalopathy, osteo-arthropathy, gingivitis, stomatitis and colitis. Central nervous system toxicity, including encephalopathy, has been associated with the intake of inorganic salts including bismuth subnitrate, subcarbonate and subgallate. Difficulties in walking, standing or writing, deterioration of memory, changes in behaviour, insomnia, muscle cramps and psychiatric symptoms have been reported. These recover spontaneously after discontinuation of bismuth. A safety level of 50 μg/L and a toxic level of 100 μg/L (in blood) have been suggested.[8]

Thus acute and chronic toxic effects can arise from ingesting bismuth-containing medicines (or cosmetics). Acute effects include: loss of appetite; headache; (mild) jaundice; blue line on the gums; some gastrointestinal disturbance and even some nephrotoxicity and neurotoxicity. Chronic effects can include: deterioration of mental ability; tremor and impaired co-ordination.[9]

Three bismuth-containing medicines, covering the time period 1899 to the present-day, have been chemically analysed in order to determine the exact bismuth compounds present and their approximate percentages per tablet. Knowing these (approx.) percentages and the formulae of the bismuth compounds present the approximate weight of bismuth per tablet can be calculated. Dosages were given with all of these medicines and so comments can be made regarding possible toxic effects, and also on how or if the weight of bismuth per tablet/dose/day has changed over time. As the chemistry of bismuth can be complex we will give exact chemical formulae for the bismuth compounds identified in these analyses. In particular we will use 'sub' in a chemical name only when the oxide or hydroxide *is* known to be present.

All three medicines were analysed using the techniques of LVSEM (Low Vacuum Scanning Electron Microscopy) and XRPD (X-Ray Powder Diffraction). The former technique gives quantitative elemental analysis for atomic numbers (Z) of 6 (i.e. carbon) and above, and the latter technique can provide identification of the (crystalline) compounds present and their semi-quantitative percentage presences.[10]

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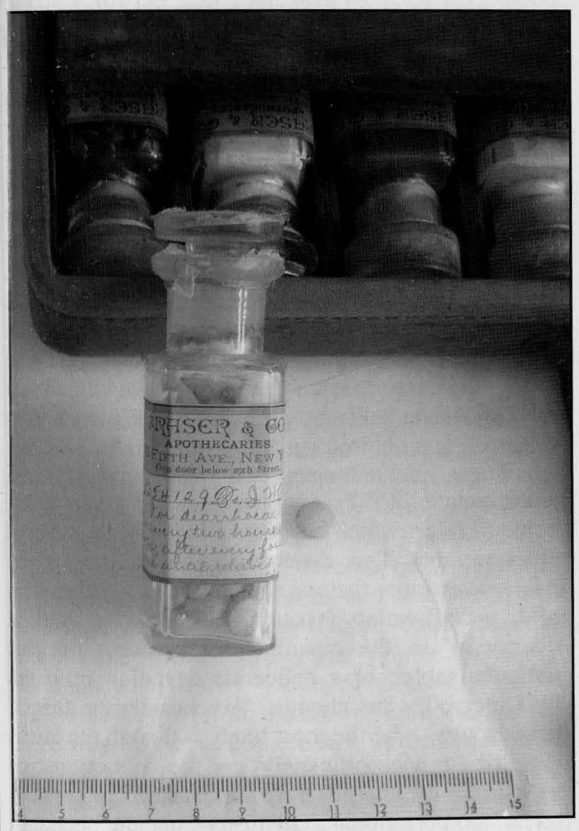
Tablets BH3

The first bismuth-containing medicine (labeled by the authors as 'BH3') was in a glass container in an American-made medicine chest dated to 1895-1899. The chest was labeled: 'Prepared and supplied by: Fraser and Co. of New York, USA'. The glass container's label had the date '9.21.99' (that is 21st September 1899) and had the name 'Dr. J. H. Clark' written on it. The dosage information written on the bottle's label was: 'For diarrhea, one every two hours until better, after every four hours until relieved'. No mention was made of its chemical composition. Each tablet was white in colour and weighed 325 mg [5 grains].



The LVSEM results were (in decreasing order of weight percent): O and/or N (uncertainty from peak overlap), Bi, C, Si, Mg. The XRPD results were (with approximate percentages in brackets):

Bismuth subnitrate hydrate of formula: $[Bi_6O_5(OH)_3](NO_3)_5.3H_2O$	(47%)
Bismuth subnitrate hydrate of formula: $[Bi_6O_6(OH)_3](NO_3)_3.1.5H_2O$	(13%)
Phenyl salicylate ('Salol') ($C_{13}H_{10}O_3$)	(30%)
Talc ($Mg_3Si_4O_{10}(OH)_2$)	(5%)
Unknown	(5%)

In a 1978 publication[11] it was stated that 'About fifteen bismuth basic (*that is our 'sub'*) nitrates have been described in the literature since the 17th century' and it listed the five that had been 'most adequately characterised'. It then went on to describe the crystal-structure analysis of one such subnitrate – $[Bi_6O_5(OH)_3](NO_3)_5.3H_2O$ (now called '**A**') – the major component in BH3. This compound (**A**) is one of the most easily and commonly made subnitrates; where all such compounds are synthesied by the hydrolysis, at varying pHs, of bismuth nitrate pentahydrate ($Bi(NO_3)_3.5H_2O$). In a later (2000) publication,[12] the number of such compounds, with known compositional and (at least some) crystallographic data, is nine – which includes the two bismuth subnitrates synthesied and studied (by XRPD) in the publication. One of these two compounds is the second bismuth subnitrate found in the tablet (at approx. 13%, and now called '**B**').

It is possible that some 'bismuth subnitrate', for use in the tablets for this American-made medicine chest, was purchased commercially and locally. Merck & Co., Inc. was located in New York city in 1899 and does list bismuth subnitrate in its *Merck 1896 Index*[13], and so could be a possible commercial source.

Bismuth subnitrate (BSN) was probably the first bismuth compound to be used, in the Middle Ages in Europe, as a medicine (it was also being used as a face cosmetic and as a pigment in paintings). By the 19th century it, along with other bismuth compounds, was being used in both Europe and the USA for various gastric disorders. However, extensive medicinal use of very high oral doses (sometimes 10g or more a day for months, even years) of BSN lead to toxicity in several countries in the 1970's. In France, by 1979, almost 1000 cases of bismuth-associated encephalopathy had been reported, of which 72 were fatal.[6,9]

It was recently shown that BSN was sparingly soluble (< 0.5%) in human gastric juices, that bismuth was barely absorbed (< 0.01%) into the blood stream and that it was inactive against *Helicobacter pylori*. However, when it was used *in vivo* with antibiotics (i.e. triple therapy) it **was** effective in partially (74%) eradicating *H. pylori*.[14]

Using the above values for: the weight of the tablet; the (approx.) percentages and molecular formulae for the bismuth compounds in the tablet; the recommended dose and the maximum number of tablets per day – then the total weight of the bismuth compounds (and of their associated bismuth) can be variously calculated. Thus, for this medicine (BH3) the (total) weight of the bismuth compounds and of the bismuth present are respectively: for the tablet and a single dose (1 tablet), 195mg and 141mg; and for the max. daily intake (8 tablets), 1.55g and 1.13g.

The other (assumed) 'active' ingredient in BH3 is salol (phenyl salicylate). Its concentration of approx. 30% is too high for it to be present merely as an enteric coating; it was probably present as an internal antiseptic and/or as an antipyretic. Its use at this concentration would now be questionable, as it can be toxic from the liberation of phenol.[15] The talc found (at approx. 5%) was assumed to be present as a tablet lubricant.

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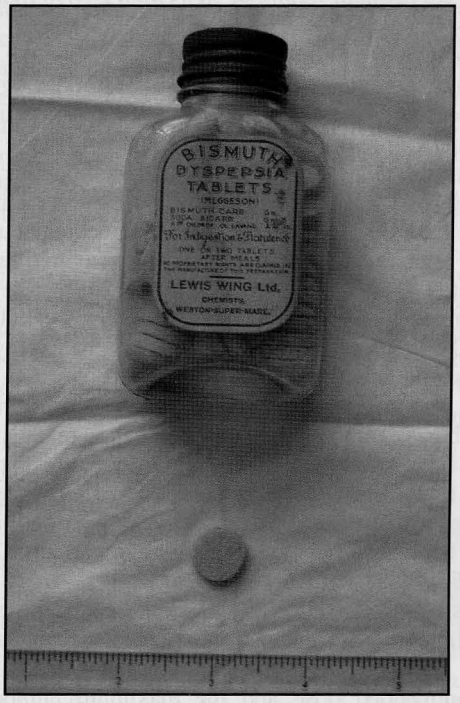
Bismuth Dyspepsia Tablets (Meggeson)

The second bismuth-containing medicine was from a glass bottle, of SW UK origin, named on its label as 'Bismuth Dyspepsia Tablets (Meggeson)' (labeled by the authors as 'WSM3') and dated to the 1940s. On the bottle's label was the dosage information: 'For Indigestion & Flatulence. One or two tablets after meals'. The name of the dispensing chemist was also given as: 'Lewis Wing Ltd., chemists, Weston-Super-Mare'.

The composition, on the bottle's label, was partly worn away (an * or ? is given where it is either unreadable or partly readable respectively):

Bismuth Carb. Gr. *
Soda Bicarb. Gr. 3
Sp. Chlorof. Ol. Lavand. AA? qs?

Gr. is an abbreviation for Grain (64.8mg). Each tablet was yellow-white in colour and weighed 729mg.



The LVSEM and XRPD results were (as before, plus the element given in brackets for the former is at the 1% level or less): O, C, Bi, Na (Ca) and:

Bismuth subcarbonate of formula: $(BiO)_2(CO_3)$ (20?)
Sodium bicarbonate (NaHCO3) (20?)
Unknown (but thought to be 'lozenge base', see below) (60?)

The '?' after the above approx. percentage values reflect the following: there was some peak overlap in the diffraction pattern; the possibility of various impurities being present (e.g. hydrates of both the sodium and bismuth compounds); that some of the original constituents had evaporated over time (the chloroform and lavender) and the unknown nature of the 'lozenge base' (see below).

For this tablet (WSM3) it was assumed that all the lavender and chloroform (i.e. the spirit of chloroform used as solvent for the oil of lavender) had totally evaporated. Thus its weight now (729mg; that is 11.25 grains) is less than its original weight. If its original weight is assumed to have been 13 grains (0.842g) then the 3 grains of sodium bicarbonate on the label represents 23.07% of the (original) tablet by weight. This percentage exactly matches the percentage given for the proprietary medicine 'Meggeson Brand Bismuth Dyspepsia Tablets' in the 22nd Edn (1943) of *The Extra Pharmacopoeia*.[16] Also given in this recipe are the percentages for bismuth carbonate, at 7.69%, chloroform, at 7.23% and 'Lavender lozenge base' to 100%, that is at 62.01%. The percentage of 7.69% represents exactly 1 grain of our (original) 13-grain tablet, and 1 is thus most likely the number worn away on our bottle's label. The 'lozenge base' is most likely: a mixture of sugars, plus possibly acacia and/or tragacanth, and sometimes gelatin,[17] which we have assumed is the 'unknown' in our XRPD results above.

Thus our tablet is assumed to have been made according to the (1943) recipe (where the bismuth carbonate given on the label and in the recipe should, in reality, be termed subcarbonate). However, whilst the recipe-expected percentages for two of the tablet's components (i.e. the sodium bicarbonate and the lozenge base) are reasonably close to those found from our XRPD data (and after allowing for the evaporation of the original chloroform and lavender), the (XRPD) percentage value calculated for the bismuth subcarbonate (20%?) is higher than that given in the recipe (7.69%; which becomes 8.89% for the present tablet weight). This discrepancy could have arisen from one or more factors, such as: severe, rather than mild, peak overlap in our XRPD data; a random 'aberration' in the manufacturing process for this particular tablet; or a deliberate deviation from the 1943 recipe by this chemist. We consider the first of these factors to be the most likely, although the last is a possibility (unfortunately no prescription recipe books from the chemist have survived).

The compositional chemistry of the bismuth subcarbonate (BSC) is not as complex as for the subnitrate, and it does exist as the secondary mineral 'bismutite' (discovered in Saxony in 1841). Also, a few of its hydrates exist, as do a few mixed metal subcarbonates (e.g. where the bismuth is partially replaced by calcium and/or lead).[18] As for BSN, it was used extensively (often listed as basic bismuth carbonate) in the 19th century for various gastric disturbances, sometimes in large short-term doses of 10g, three times daily. Even higher doses (20g at 4-hour intervals) were apparently used for the successful elimination of threadworms.[15] Again, like BSN, both the aqueous solubility and blood stream absorption of bismuth from BSC is very low. However, its absorption relative to BSN is variously described as 10 – 20 times less or as comparable.[19] Its

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toxicity is sometimes stated to be less than for BSN; although the relative toxicities may well vary depending on the exact formulae of the bismuth compounds being compared.

Using the same calculations as used previously for BH3, on the data for this medicine (WSM3), then the weight of BSC and of its associated bismuth can be variously determined as before. Thus, for this medicine the weight of BSC and of bismuth present are respectively: for the tablet, 65mg and 51mg; for the maximum single dose (2 tablets), 130mg and 102mg; and for the max. daily intake (6 tablets), 390mg and 300mg.

The other (assumed) active ingredients in the original WSM3 tablet are: the sodium bicarbonate (antacid), chloroform (carminative, sweet-tasting) and lavender (as for chloroform and is sweet-smelling).[15]

Pepto-Bismol

The third bismuth-containing medicine was the OTC American medicine 'Pepto-Bismol' (labeled by the authors as 'PB1'), and was bought in the USA for us in 2005. Each tablet was light pink in colour and weighed 993mg. The LVSEM results were (as before): O, C, Ca, Bi, Si (Mg, Al). The XRPD data obtained allowed identification of five of the eight listed (on an enclosed leaflet) inactive ingredients – that is for: calcium carbonate, magnesium stearate, mannitol, saccharin sodium and talc – and *not* for: flavour, povidone and red 27 aluminium lake; plus to confirm the presence of the listed active ingredient, bismuth subsalicylate [$C_7H_4O_3$(BiOH)].[20] However, as the diffraction pattern was extremely complex and had multiple overlapping peaks it was not possible to estimate the percentages of the compounds identified. Thus, in all future discussions and calculations, the amount/percentage of bismuth subsalicylate present in this sample will be that given on the medicine's accompanying leaflet (i.e. 262mg/tablet, that is 26%/tablet). Apart from the above compositional data there was also dosage and usage information on the enclosed leaflet; stating that it could be used to relieve: 'heartburn, indigestion, upset stomach, nausea and diarrhea' and the dosage for adults and children over 12 was given as: '2 tablets every ½ to 1 hour as needed and do not exceed 8 doses (16 tablets) in 24 hrs, and use until diarrhea stops, but not more than 2 days'.

The original Pepto-Bismol was invented (and initially called 'Mixture Cholera Infantum') in 1901 by a doctor in New York, USA. He used it for treating 'cholera infantum' (that is a sudden onset of vomiting and diarrhoea in infants). The original recipe (which he later gave away to Norwich Pharmacal Company in Norwich, New York) consisted of bismuth salicylate, pepsin, zinc salts, salol, oil of wintergreen and a colourant to make it pink. Once it was realised that the active ingredient was the bismuth (sub)salicylate then the medicine's recipe was changed to that used today. The name Pepto-Bismol was first used by the company in 1919 in order to sell it to adults.[21]

The compositional chemistry of bismuth subsalicylate (BSS) is less complex than for the subcarbonate or subnitrate; and whilst bismuth subsalicylate is not as old a medicine as the subnitrate, it was being used as early as 1857 for the management of several diseases of the digestive tract.[22] As found for both BSN and BSC, the aqueous solubility and blood absorption of bismuth from BSS is very low.[23] However, the salicylate end of the molecule **is** significantly absorbed (approx. 90%) into the blood and can give rise to poisoning, and even death, if BSS or other salicylates are used to excess.[24, 25] BSS was, and is still, extensively used for treating travellers' diarrhoea. It has been found that whilst it does have a modest effect on acute diarrhoea of young children, there is currently uncertainty concerning its efficacy in preventing the associated persistent diarrhoea.[22, 26] It has also been successfully used, either alone or in combination with antibiotics (i.e. triple therapy), for the eradication of *H. pylori*.[6]

Extended dosing of Pepto-Bismol (3.14g BSS daily) for up to 6 weeks produced a mean blood-bismuth concentration of 16.1 +/- 7.9 ng/g, considerably below concentrations in blood that have been reported to cause neurotoxicity. Neurotoxicity studies in animals and human safety data indicate that Pepto-Bismol can be used safely for its acute indications and for up to 3-4 weeks of extended dosing.[27]

Using the compositional and dosage data provided in its (PB1) accompanying leaflet, then the weight of the bismuth compound (BSS) and of its associated bismuth can be variously determined as before. Thus, for this medicine the weight of BSS and of bismuth present are respectively: for the tablet, 262mg and 153mg; for a single dose (2 tablets), 524mg and 304mg; and for the maximum daily intake (16 tablets), 4.19g and 2.43g.

Comparison

Thus the weight range of bismuth ingested from these three analysed medicines per dosage/day varies from 100mg/300mg (subcarbonate in WSM3, 1940s, UK) to 140mg/1.13g (subnitrate in BH3, 1899, USA) to 300mg/2.43g (subsalicylate in PB1, present-day, USA). These numbers compare well with those found in recent case studies: 160mg/160mg for bismuth from BSC in 'Dignodenum', used once on healthy volunteers with no toxic effects;[19] 410mg/1.23g for bismuth from BSN (as part of triple therapy), for four weeks on *H. pylori*-positive patients with no toxic effects;[14] 300mg/900mg for bismuth from BSS in (liquid) 'Pepto-Bismol', used once on healthy volunteers with no toxic effects.[23] For bismuth (neuro)toxicity to occur from BSC and BSN there must be extended over-usage – that is over ten times the above daily doses for months, if not years;[6, 9, 19] for BSS usage at such high oral doses there is the high probability of salicylate poisoning occurring before that from bismuth.[24]

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All the bismuth compounds used in these three medicines are weakly soluble in aqueous solution/human gastric juices and are also weakly absorbed into the human blood stream. This gives them all a low toxicity, and only excessive over-dosing (i.e. 10g or more a day) for an extended period of time (months, even years) leads to bismuth poisoning. All were used in the past for treating a variety of gastrointestinal disorders, such as flatulence, nausea and dyspepsia. After WWII, with the advent of antibiotics, their use drastically declined. However, they do survive, for example: Pepto-Bismol (BSS) for travellers' diarrhoea being the most extensively used, mostly in the USA; then, in limited usage as Roter (BSN) for diarrhoea and as an astringent in skin dusting powders, mostly in Europe; and, in a more limited present-day usage, for BSC, in Dignodenum (Germany) for treating gastritis and, as a veterinary product (in the UK) for cats and dogs, in Johnson's Diarrhoea Tablets. From the 1980s there has been a resurgence of interest in the therapeutic use of bismuth compounds for the treatment of ulcers and their often associated *H. pylori* (discovered 1982), often in combination with antibiotics (i.e. triple therapy). Though the exact mechanism by which bismuth works here is unknown,[6] the fact that its absorption is apparently **not** required for its efficacy means a new interest in the use of weakly soluble/absorbed bismuth compounds (such as BSS, BSC and BSN) is now underway.

Conclusions

In this article we have given a brief overview of bismuth compounds usage in medicine and of its associated toxicity. Chemical analyses of three bismuth-containing medicines covering the time period 1899 to the present-day have been considered. The weight per tablet has increased from 325mg in 1899 to 729mg in the 1940s to 993mg in 2005, and this reflects the increasing amount of inactive ingredients added to medications in general over this time period. The approximate amount of bismuth/tablet has varied from 140mg (1899, USA, BSN) to 50mg (1940s, UK, BSC) to 150mg (2005, USA, BSS). However, even when exceeding the maximum prescribed dosage for each of these three medicines, bismuth toxicity is unlikely or will be of a transient nature. The worst that could be expected from the **normal** dosage usage of these and other present-day bismuth-containing medicines is the formation of black stools or black tongue, which may lead to some patient alarm, but little else.

Acknowledgements

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Author's addresses: Corresponding author: Andrew Hardy BSc, DPhil, Centre for Medical History, School of Humanities and Social Sciences, University of Exeter, Exeter EX14 4RJ, UK. E-mail: A.D.Hardy@exeter.ac.uk ; Ragini Vaishnav BPharm, MSc, PhD, College of Medicine, Sultan Qaboos University, Box 35, Al-Khod 123, Sultanate of Oman. E-mail: ragini@squ.edu.om

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Pharmacy, Trade and Empire: Medicines and the English East India Company 1600 to 1858

Stuart Anderson
London School of Hygiene and Tropical Medicine

1. Introduction

During the fourteenth and fifteenth centuries, at the time of the spicers and pepperers, a small but significant proportion of the medicines used in England were being imported from abroad. Drugs of eastern origin found their way here as a result of the increased continental traffic that followed the Crusaders' journeys, and the growing activities of the Lombard and Hanseatic merchants.[1]The former were settling in London and elsewhere and were establishing substantial businesses in drugs and spices through their contacts in Italy and beyond. Drugs were also being imported through Montpelier in France, a major centre of medical and pharmaceutical teaching. This was on the main spice route of the Mediterranean as well as being on the pilgrimage route to the Holy Land.

By the sixteenth century a wide range of natural products were being imported from the East, particularly India, and being used for medicinal purposes.[2] But in the early seventeenth century, with the founding of the English East India Company ('the Company') on the last day of 1600, there was a rapid change in both the nature and type of trade in drugs and medicines, particularly between the East Indies and England. There was in fact a dramatic increase in the quantities of drugs imported into England; in 1588 only 14 per cent of the drugs used were imported from outside Europe; by 1669 this figure had increased to 70 per cent, with most coming from the East Indies and India.[3]

The imports were sold to wholesale druggists, who repackaged them into smaller quantities for use by apothecaries in towns and rural areas.[4] Most of these imports came into Mincing Lane, London, which was later to become famous as the world's leading centre for tea and spice trading after the English East India Company took over the trading ports of the Dutch East India Company (V.O.C.) in 1799.[5]

But the flow of medicines was not just in one direction. The expansion of trade with the East Indies brought with it opportunities for potentially huge exports of many commodities, including medicines. Increased trade also meant more trading ships and naval ships to protect them, increasing ex-patriate communities to administer the trade and the growing colonies, and increasing armies to defend the territories annexed; all of these had need of medicines.

But the fortunes of the Company fluctuated wildly during its two hundred and fifty year history. In her biography of the East India Company Jean Sutton suggests that its trading life falls into four main periods.[6] These are shown in Table 1. The early successes were followed by the near collapse of trading activity, but successive wars and events in India led to renewed trading opportunities.

2. Supplying Medicine Chests to the Company's ships

Initially the East India Company based its arrangements for the supply of medicines to its ships on the well established ones operating in the Navy. All naval vessels carried surgeons, and an essential part of the surgeon's kit was the medicine chest. Initially both the Navy and the East India Company obtained their medicine chests from private apothecaries. We know, for example, that the apothecary George Haughton was supplying medicine chests to the East India Company as early as 1634.[7] The Society of Apothecaries, which was founded seventeen years after the Company in 1617, only began manufacturing medicines in the early 1670s with the opening of its laboratory, but not until 1702 did it obtain the privilege of supplying the Fleet

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with medicines from Queen Anne. A special company called the 'Navy Stock' was set up by the apothecaries to fund this venture.[8]

Table 1: Periods in Company's trading history and sources of demand for medicines

Period	Overall state of the Company's trade including drugs and	Sources of demand for medicines from England
1600 to 1657	Early successes followed by decline, followed by near cessation	Supplies to the Navy
1658 to 1703	Period of growth following introduction of new charter and advantageous	Supplies to East India Company Ships
1704 to 1773	Period of regulation and consolidation	Supplies to the Company's outposts
1773 to 1834	Return to diversification in response to changes in	Supplies to the Indian Army and local communities

Initially the 'Navy side' of the business at Apothecaries Hall consisted largely of supplying medicine chests for surgeons. It expanded only slowly, sales averaging about £200 a year during the first two years. But in 1704 the British Fleet in the Mediterranean was desperately short of medicines. As a matter of urgency the Society's Navy Stock was instructed to supply internal and external medicines, which were to be transported by the next convoy leaving for Lisbon. From there, Vice-Admiral Sir John Leake was to distribute the chests to thirteen of Her Majesty's ships in the Mediterranean.[9]

As bases were established overseas an additional demand arose to supply the garrisons with medicines. The Society obtained contracts to fit out surgeons' chests for both hospital ships and the garrisons at Gibraltar and Lisbon. Sales increased to about £800 by 1740, rising to a peak of £1,700 a year in 1768. After this they settled at around £700 a year. By the end of the eighteenth century naval surgeons' chests from Apothecaries Hall were being sent to Newfoundland, Minorca, Jamaica, Gibraltar and Lisbon, as well as to the ports of the East Indies and Australia.[10] This monopoly of supply to the Navy was only discontinued in 1805, after over 100 years.[11]

To conduct its trade with the east the East India Company hired ships in London. From the beginning every ship carried a surgeon, and the larger ones carried up to four: all required an extensive medicine chest, and this represented a substantial trade in its own right. The demand for medicines for the Company grew steadily as British activity in India expanded. The fleet of the East India Company provided the means by which trade in drugs and medicines might be developed.

Table 2: Ships of the East India Company 1600 to 1834

Period in Company's history	Years	Number of ships Owned or hired
Period 1: Initial	1600-1657 (57 years)	130 ships
Period 2: Consolidation	1658-1703 (45 years)	290 ships
Period 3: Expansion	1704-1773 (69 years)	391 ships
Period 4: Final stages	1774-1834 (60 years)	427 ships
	Total:	**1,238 ships**

With each period in the Company's history the number of ships involved, known as 'Indiamen', increased. Over the 250 years of its life the Company used a vast number of ships; some 1,200 ships were either hired or owned by it, and nearly 10,000 voyages were completed.[12] At various points in its history the Company also had its own shipyards, its own dry docks for repairs, and its own docks to load and unload them. The total number of ships involved is listed in Table 2.

3. Supplying the army in India

The years of peace, between 1713 and 1739, brought an initial lull in demand for medicines by the Company. But war broke out again in 1739, continuing until 1748, which generated increased demand for the restocking of surgeons' medicine chests. The year 1747 saw a new development: in that year a squadron of East India Company ships set sail from Spithead, the departure point for its ships in times of war. Each ship carried a detachment of royal troops, sent to relieve Fort St David at Cuddalore in India, where the Company's staff had retreated following the fall of Madras in the same year. These were the first ever troops to be sent to India.[13] Thus arose another

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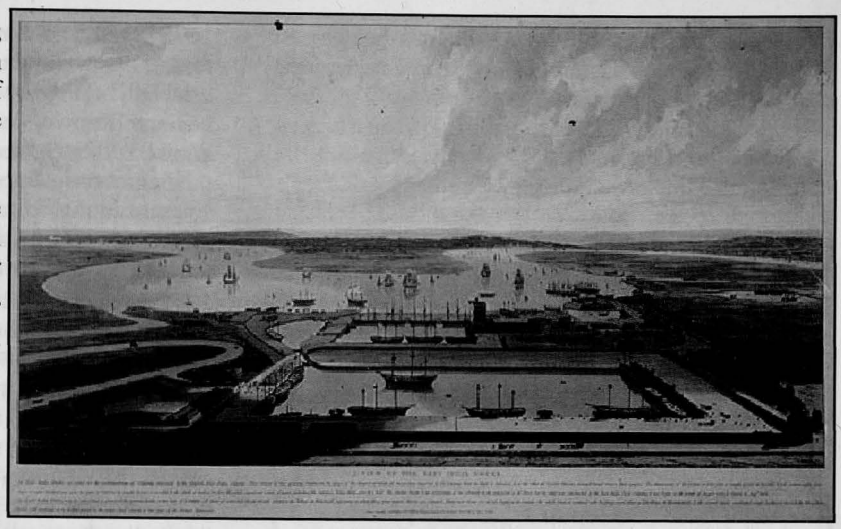
source of demand for medicines; that of supplying medicines in medicine chests for the use of army surgeons employed by the Company.

The return to peace following the end of the war against the French in India in 1748 again resulted in reduced demand for medicines from the Company, both for its ships and the army. But the Society of Apothecaries' lucrative contracts with both the Company and the Navy were the source of substantial envy in some quarters. A pamphlet in 1748 drew attention the previous dealings that the East India Company had had with the Society, stating that the Company had dealt 'for several thousand pounds a year with these emulsioneers, this bunch of pulp-pated pill gilders' of Blackfriars.[14] However, the Company also appears to have placed some of its business elsewhere from time to time, to 'the Bevans of Lombard Street and to Johnson of Fenchurch Street, since they were cheaper'.[15]

The scale of the Company's operations in India escalated with the taking and development of Madras, and Clive's later adventures in Bengal. During the Seven Years' War, between 1756 and 1763, there were some 20,000 troops in India. The pacification of Bengal in 1766 brought generous dividends to shareholders in the East India Company, and improved business opportunities. In October 1766 the directors of the Company again looked to the Society of Apothecaries for the supply of the medicines it needed, and awarded a new and bigger contract to the Society, or the 'Best-side Banditti of Black Friars' as the anonymous pamphleteer described them. The directors of the Society took the opportunity to produce 'an enticing catalogue of the chemical preparations available from the Hall'.[16]

However, the Company suffered another reversal of fortune at the end of the eighteenth century, as a result of armed conflict in central India and mismanagement back in London. As a result the Company was stripped of its trading privileges. Yet medical supplies were still needed for an Indian Army which was to grow to around 300,000 men by 1820.[17] In 1810 the Army Medical Board approached the Society with an urgent request: the Society quickly confirmed that it could supply medicines for an army of 30,000 men from Apothecaries Hall within ten days.[18] The Society was proud to boast that 'the whole army of India (we believe exclusively) is served under the direction of the Honourable United India Company [as the East India Company had now become] from our establishment'.[19] This privilege yielded the Navy Stock an average of £20,160 a year for the first decade of the nineteenth century.



View of East India Docks, London, 1808

4. Supplying civilian communities

As the activities of the East India Company expanded the directors decided that, in future, not only the ships and army but also all the outposts of the Company should be supplied from Apothecaries Hall 'with the drugs and medicines that may be wanted for the several Presidencies, notwithstanding their prices exceed those of other persons, as there is a certainty of being supplied by them with the best of medicines and drugs, every article coming under the inspection of a deputation from the College of Physicians and the Surgeons Company'.[20]

The influence of the surgeons employed by the East India Company extended far beyond that of the ships on which they worked. Many stayed on in the Company's outposts, in both India and elsewhere. Medical personnel employed by the Company, and later by the British Crown, were instrumental in introducing the western medical system in India and turning it into the official system of health care in that country, as well as others.[21] The Indian Medical Service traces its origins to the beginning of the seventeenth century as a component of the empire-building exercise.[22] The impact of colonialism was also seen in medical education. In 1827 a series of lectures was started in Indian colleges based on European teaching.[23] The medical acumen of two legendary figures, Gabriel Boughton and William Hamilton, has been stated to have aided the East India Company in establishing a foothold in the sub-continent.[24]

India itself was a staging post for the much longer journey to the islands of the East Indies, to Indonesia and later Singapore, which took many months. Often, the ships would be away from home ports for several years. On their return journey from India the Company's ships stopped off at St Helena, and a thriving British community sprang up there to supply them with fresh meat and water, fruit and vegetables, and the many other commodities needed by ocean going ships. The actions of medical personnel and

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others in all these places further increased the demand for medicines from England, which would be brought out on the ships of the East India Company.

Detailed records remain of some of the cargoes carried by the Company's ships. In one year alone the consignment included 10,000 pounds of Glauber's Salts and 28,000 pounds of Epsom Salts.[25] These were part of the Indian order made up and packed at Apothecaries Hall for shipment to Bengal, Bombay, Madras, Fort Marlborough, Prince of Wales Island and St Helena. Details of the consignment are given in Table 3.

Table 3: Consignment of medicines to India 1821

Medicinal substance	Quantity
Glauber's Salts	10,000 pounds
Epsom Salts	28,000 pounds
Citric acid	large quantities
Terebinth	large quantities
Arsenic	large quantities
Ointments	Many casks

As trade expanded, further trading stations were established around the Indian coastline, and an additional need arose to supply these with medicines. But the British presence was concentrated in the main cities, which in the early nineteenth century were Calcutta, Bombay and Madras. In due course British pharmacists began to set up businesses across India, and substantial quantities of medicines were imported to meet local demand.[26] These imports arrived in the Company's ships. Eventually however, pharmaceutical manufacturing was established in India itself, and the need to import vast quantities of medicines diminished rapidly.[27]

5. Supplying the drugs and medicines needed by the Company

Growing demand for medicines from both the Navy and the East India Company created increasing challenges for supply to the Society of Apothecaries in the early years. Initially, the Society acted only as a retailer, buying its medicines from other local suppliers. As the trade grew it first set up its own laboratory to manufacture what it could on a much larger scale. As time went by it recognised the need to grow its own herbs and medicinal plants, setting up the Chelsea Physick Garden. It even acquired its own mill to powder its dried medicinal plants.

The Society had established a laboratory for the compounding of vegetable medicines as early as 1623, but this was only for the instruction of apprentices. The College of Physicians had previously set up a manufacturing facility, but this was destroyed in the great fire of London in 1666.[28] Following the fire, in 1672 seventy apothecaries subscribed a total of £1,205 to set up a company, then known as a 'stock', to establish their own manufacturing facility. This became known as the 'Laboratory Stock'. This allowed the Society to manufacture a range of medicines on a large scale, with the benefits of reduced costs resulting from mass production. It also gave it the capacity to guarantee the purity of commercially produced drugs for the first time.

When the contract was granted to supply the Navy with medicines in 1702 an additional joint stock company, the 'Navy Stock', was established. This supplied medicine chests to the Navy, but these were actually prepared in the laboratory. By the early nineteenth century the laboratory was supplying not only the East India Company but also the army, the prison service, the crown agents, convict ships to Australia, chemists, druggists and infirmaries. The two stocks were merged in 1822, forming the 'United Stock,' and manufacturing continued on the premises of the Society until 1921.[29]

In due course the Society found it necessary to develop the capacity to grow it owns herbs and plant medicines. With this in mind it set up the Chelsea Physick Garden shortly after the establishment of its laboratory, in 1673.[30] The Society rented four acres on the Chelsea riverside from Lord Cheyne. Three years later a wall was built around it. The garden's original purpose was to grow plants that were no longer easily found in fields and woods, along with the exotic plants being imported from the East in ever greater numbers.[31] It also had an important educational function, but increasingly it became a source of raw materials needed by the laboratories.

As trade increased still further the volume of plant material that needed to be transported by horse and cart across London from Chelsea to the laboratory in Blackfriars was substantial. Late in the eighteenth century the Society acquired an old 'horse-mill', across the river from the gardens in Battersea.[32] The mill had previously been used by John Field, who was Master of the Society between 1785 and 1786, and his son Henry, who was Apothecary to Christ's Hospital and was Treasurer to the United Stock. Here the drugs were ground before being sent to the Hall for final preparation.[33]

It appears that the windmill in Battersea was only used for a relatively short time. Plant material and other crude drugs also arrived at the docks in London from India and elsewhere, and there was a need to process drugs nearer the laboratory site. The proportion of raw material provided by the Physick Garden became ever smaller. An opportunity to extend the trade premises at the Blackfriars site came in 1801, with the purchase of land to the north of the laboratory. This was used to erect a Mill House and a separate engine house to drive the mill.[34] The new Mill House accommodated three pony-powered stone mills, and was only demolished in 1915.[35]

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6. The Company's commitment to quality

One of the main reasons why the Society was able to retain its contract with both the Navy and the East India Company over such an extended period was that it placed great emphasis on the quality of its products. Clear arrangements were in place to ensure that this happened, with regular monitoring of production processes and final products. Its operations were headed by a Court of Proprietors, with a committee of managers, a purchasing committee, an inspection committee and another to regulate prices. These measures enhanced the Apothecaries' reputation for good quality medicines and drugs, but made them expensive.

The quality of the Apothecaries Hall medicines and drugs was widely recognised at a time when the quality of what was offered by many suppliers was highly questionable. For example, the apothecary John Quincy noted approvingly 'the care of the Apothecaries Company, who with a joint stock have these medicines made at their Hall under such careful management and inspection as cannot give any possible opportunities for impositions.'[36]

Like its contract with the Company, the contract that the Society had with the Navy was not without its detractors. The naval surgeons resented the high prices charged for medicines and drugs, which they were obliged to obtain from Apothecaries Hall, as a result of the Order signed by Queen Anne in 1702. It could cost between £80 and £90 to fit out one chest. There were also complaints about 'the system of certificates, delays, burnt hartshorn [ammonium bicarbonate], and insufficient supplies'.[37]

Despite the initial difficulties and complaints from the Navy, in the early eighteenth century the focus on the quality of its medicines by the Society and its resulting reputation resulted in the approach from the Company to supply the medicine chests for the surgeons on its ships. The Company put quality before price when it came to medicines. Representatives from the Company first inspected the surgeons' chests at Apothecaries Hall in 1706, and it seems likely that a contract to supply them over the following years resulted from that visit, although evidence of a formal contract is lacking.[38]

As a further safeguard against the quality of the medicines supplied by the Society, the East India Company employed its own Inspector of Medicines, indicating the scale of its purchase of these items. The inspector, along with the officers of the Royal College of Physicians, the Physician to Greenwich Hospital and the First Commissioner for the Sick and Wounded, were given places of honour at the Apothecaries dining table, held in the Great Hall, for what has been described as 'the eighteenth century equivalent of corporate hospitality'.[39] Thus was the relationship between the Company and the Society sealed.

If there was trust between the Society and the Company the same could not be said of the different groups of the Society's stockholders. The award of the new East India Company contract in December 1766 necessitated the establishment by the Society of new Articles of Agreement, allowing for an increase in the capital of the Navy Stock to £12,000. As on previous occasions there were serious disputes amongst the members of the Society about who should benefit.

There were two main classes of membership of the Society; the Liverymen and the Yeomanry. Only Liverymen who were Proprietors (or stockholders) of the so-called 'Laboratory Stock' were permitted to take up the new shares in the Navy Stock, a condition that elicited an angry response from the disgruntled Yeomanry. 'The great increase and extension of the trade' continued during the Napoleonic wars, extending from the end of the eighteenth century up to 1815. This was to be of greatest benefit to the Liverymen, the sole Proprietors of the Navy Stock.

The anger of the Yeomanry appears to have been more than justified. In the 1730s profits from the Navy Stock were modest, estimated at around £175 per year. The year 1739 to 1740 was exceptional, with profits surging to £843. It was followed by an increase in the capital of the Company the next year. As a result of the East India Company's new contract profits reached £1,677 for the year 1766-67, and shareholders received good dividends.[40] But only the Liverymen benefited.

7. The Relationship between the Company and the Society

The Society and the Company maintained a close relationship for over one hundred and fifty years. There were many alternative sources of supply available to the Company. But the significance of the medicine business was rather different for the Society than it was for the Company. Despite the sums involved the trade in medicines was always only a small part of the business of the Company, which was vast. By the 1720s the paid-up share capital of the Company was almost £3.2 million, with an annual turnover of many hundreds of thousands of pounds.[41] But for the Society the trade with the Company and the Navy represented the core of its business for many years.

The two institutions had much else in common. The Worshipful Society of Apothecaries was founded in 1617, just 17 years after the founding of the East India Company. The headquarters of these two great institutions were located about a mile from each other in the city of London; the Society was located in Blackfriars Lane, close to the River Thames, where it is still located. The headquarters of the East India Company were in the City of London, initially at Cosby Hall, and then in Lime Street, before moving the short distance to Leadenhall Street in 1817.[42] This building was eventually demolished in 1929. Thus throughout their history the headquarters of the two institutions were no more than a short distance from each other.

We can only speculate about some of the other links between the two institutions. At least some of the

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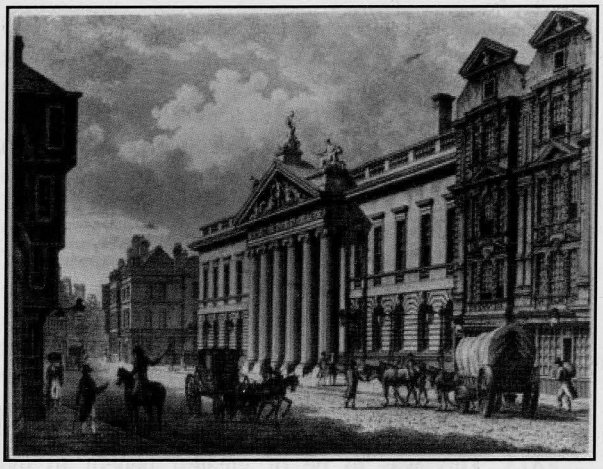

East India Company Headquarters, Leadenhall Street, London, 1820

investors in the Society were likely also to have been investors in the Company. During its lifetime many thousands of well-to-do individuals chose to invest in Company stocks and bonds.[43] Some of these could well have been apothecaries. It seems probable that at least some of the Liverymen who held shares in either the Laboratory or Navy Stocks also held shares in the East India Company. Both institutions, but particularly the East India Company, were significant employers in the area. It also seems quite possible that there was at least some movement of staff between the two institutions.

8. Epilogue

The period covered in this paper was one during which the British Navy was busy fighting wars around the world. The East India Company itself was actively involved in wars over an extended period, and was in fact directly involved in controlling large areas of India through its army. For the Society of Apothecaries war was good for business, but for the East India Company war was to be its downfall.

For the East India Company the beginning of the end came in the form of the Charter Act of 1833. Through this the British government divested the Company of its commercial functions, but renewed its political and administrative authority for another twenty years. The end of the Company came as a result of the Indian Mutiny in 1857, although in truth it slowly faded away rather than suffering a sudden death. It was formally dissolved in 1858, although core staff continued to be employed for a number of years afterwards. Its headquarters at India House were demolished in 1862, after which staff moved to a succession of rented addresses. The Company was finally wound up in 1873, but even then a number of transactions were still being followed up, and the last cheque was finally honoured by the Bank of England only in 1884.[44]

The nineteenth century treated the Society of Apothecaries more kindly. It continued to receive substantial orders from the Navy even after the ending of its monopoly position in 1805. Indeed, between 1806 and 1811 the cost of drugs, medicines, pill tiles, bottles, corks, galley pots, mortars and pestles, needles, funnels, sponges, and many others, supplied to the Navy by the Society averaged £24,917 per year.[45] This was in fact the Society's largest account, being even bigger than that of the East India Company. During the same five year period the average annual bill for drugs and medicines supplied to the Company was £21,582, some £3,000 less than that for the Navy.

The Indian Mutiny of 1857 also produced a very different outcome for the Society of Apothecaries. The Council of India, which effectively replaced the East India Company as the governing authority in India, renewed the contract for drugs and medicines the Society had had with the Company, providing the United Stock with a regular income, until the final payment of just £19 in 1881 concluded the business. In that year the United Stock was dissolved, and thereafter the Society's trade relied on contracts with the Crown Agents, the Army Medical and Veterinary Departments, merchants, hospitals and retail customers, until it, too, ended in 1921.[46]

For the Society of Apothecaries the emergence of the British Raj provided additional opportunities for trade, with the growth of business within India itself. Although the medicines originally supplied were for the use of the Navy and the Company's staff, increasingly they were traded on. The history of the development of western pharmacy in India starts with a young Scot by the name of Bathgate.[47] He came to India as an employee of the East India Company, and opened his first chemist's shop in Calcutta in 1811. At that time Bathgate's shop was the most familiar centre for the supply of medicines for the citizen's of the town. The firm that he founded eventually took up drug manufacturing for the Indian market, especially of tinctures and spirits, in 1910.[48]

For India, the end of the East India Company and its ships made little difference to its export trade in raw drugs to Great Britain. There were many private shippers and merchants only too eager to take its place. Four key products came to dominate the market; opium, cinchona, nux vomica and senna.[49] In 1863 British India exported opium to the value of £12.5 million; by 1872 it had increased to £13.4 million. In 1875 India exported 72,452 pounds of cinchona to Britain, mainly from Madras; seven years later, in 1882, this had shot up to 641,608 pounds.

European drugs continued to be imported into India, but the quantities were small in comparison with the volume of raw drugs exported to Great Britain. The very first edition of the *Indian Medical Gazette* in 1866 noted that '£20,000 are annually expended in the importation of European drugs to India'.[50] It was hoped that many of these could be replaced by indigenous drugs. Both imports and exports were transported by ship, and this paper has shown that the activities of the East India Company prepared the way for the extensive trade in drugs and medicines between the two countries that followed its demise.

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Author's address: stuart.anderson@lshtm.ac.uk

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A Beginner's Brief Encounter with Early 19th Century Pharmacology

Trevor E Whaley MRPharmS, MCPP(Emeritus)
Doncaster

Why would a beginner choose a subject that deserves dedicated research, informed argument and learned opinion? It all started when I became interested in a small hospital, called St James's, and its founder, Dr George Dunn. Local Mid-19th Century and, since neither had been specifically studied before, a perfect opportunity for a beginner.[1]

From Roman times, when the military station there was called Danum, Doncaster has had the geographical good fortune to be situated on the direct route to the North from London, resulting in it being, by the middle of the 19th Century, an important staging post for coaches on the main London to Edinburgh highway. At the peak of the coaching era, with its links particularly to Leeds, the West, the East, and providing services to its own surrounding area, 70 to 80 coaches a day would probably pass through the town, requiring hostelries for travellers and the maintenance of well in excess of 1,000 horses.[2]

Then came the railways.[3] The first passenger link, coming from the West, was made in time for the St. Leger horse race of 1848 (racing being one of our other claims to fame). Then came the important link with London and the South, just in time for the 1849 St. Leger. At this time Doncaster already had a railway repair works, and it also had a totally justified expectancy of more to come, since in 1853 the Great Northern Railway moved its Locomotive Headquarters from Boston to Doncaster, which meant that locomotives and carriages would then be built in the town. The resulting influx of mechanics, their families and supporting traders resulted in an increase of 2,500 in the one year on a population which was stated, in the 1851 Census, as just over 12,000.

But how did Doncaster compare to known dates in medical history? The Dispensary Movement started in London around 1769. Considering that Doncaster was apparently, at that time, a very attractive little country town, it is not too surprising that its Dispensary did not open until 1792, when the population was still only around 5,600.[4]

The idea was that a patient (or 'proper object' as they would be known) who could not afford medical treatment could seek a letter of recommendation from a governor of the Dispensary to receive free advice and

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medicine, which could include a home visit if necessary. The governor in turn could have one patient on the books at any one time for the payment of one guinea annually. The more he paid, the more patients he could recommend.

An important rule was that there would be 'a general inoculation in the town as often as was thought necessary'. As we know, it was Lady Mary Wortley Montagu who brought this procedure back from the Middle East around 1720. The fluid from the blister of a mild case of smallpox being injected into the arm of a healthy individual to produce a mild attack, and confer future immunity. Fortunately, the situation was greatly improved when Dr Edward Jenner introduced vaccination using cowpox material in 1796, publishing details of his work in 1798. The Royal Jennerian Society came into being, and in a Dispensary minute in 1803 it was agreed that the Apothecary at the Dispensary might accept the office of Secretary to the Doncaster Jennerian Society for promoting the 'vaccine inoculation'.[5] The only further reference I could find to this was a mention in the minutes of Oct 1807 which read 'Any person wishing to have their children inoculated may apply at the Dispensary every Tuesday morning at Nine o'clock'.

Throughout most of its existence the Dispensary seems to have had the facility to provide overnight accommodation, if required, for one patient and a nurse. But, although an attempt had been made in 1845 to open one, we still did not have a hospital.

So, back to Dr Dunn, who in April 1852 wrote a circular letter to the wealthy residents of the area stating that he had purchased a small plot of land on which he intended to build a small hospital and asked them if they would care to become subscribers.[6] The local newspapers took this up about three weeks later with an article headed 'Is an Hospital Wanted in Doncaster?'.[7] From these two sources a clear picture emerged of how a serious accident would be dealt with. The surgeon would be called, but could be on his rounds which would cause delay. He would examine the patient and direct him to be taken home, or, if a stranger, to the nearest inn. The surgeon would probably have to return home to collect any necessary instruments. Meanwhile, the patient who might , for example, be a railway worker could be taken back to already overcrowded and totally unsuitable lodgings, where his room-mates could be asked to move out, or it might not even be possible to continue to accommodate him in the new circumstances. Assuming that was sorted out, the surgeon returns to treat his patient, but, as the article points out, although clean linen would probably be available for immediate and subsequent care, such things as poultices, baths, regulated temperature and the services of a trained nurse might not be so readily available.

So, opinion seemed to be on the side of a hospital. However, reading the newspaper coverage of meetings of the Dispensary Governors it appeared that the Medical Officers wanted a hospital of their own, and the lay-governors were looking for a way to amalgamate with Dr Dunn. The next meeting, which had to be adjourned because of its length, showed a definite animosity within the medical camp, with the majority of it being directed at Dr Dunn. Finally, all became clear at the resumed meeting when Dr Schofield, the Senior Dispensary Physician, called Dr Dunn a 'medical heretic', suggesting he 'followed a system which sprang from the disordered brain of a monomaniac'. Yes, Dr Dunn was a homoeopathic practitioner and his hospital would follow those principles.

Needless to say, no amalgamation was possible, the Dispensary did not get their hospital at that particular time, and Dr Dunn went ahead with his. I cannot leave Dr Dunn without mentioning his involvement in obtaining a clean water supply for the town, his election, by the workmen themselves as Surgeon to the Locomotive Sick Fund, and his later service as Mayor, Alderman and Justice of the Peace. One final point, on the morning of the inauguration of his hospital in January 1853 he had his son christened at the local Parish Church Walter *Hahnemann* Dunn.

Homoeopathy

But how could either side justify its position based on the pharmacology of the day? Although having had no interest in homoeopathy in my own career, I had no intention of 'taking sides'. I simply wanted to take the place of a mid-19th Century observer looking at available information.

It would have been so convenient if the newspaper reports had given details of the medical arguments at the meetings mentioned. They were obviously lengthy. Towards the end of the three hours of the second half of the adjourned meeting one lay-member suggested that the medical men had had all of the discussion to themselves so far, and that it might be a good idea to put them out of the room so that they could get on with the business. A second made the point that he didn't know who Hahnemann was on the one hand or Galen and Aesculapius on the other - he simply wanted a hospital. Interesting that after over 1600 years of possible medical advancement, practitioners were still making reference to Galen and the Roman god of medicine. The only specific reference to any medical practice was in Dr Dunn's denunciation of 'bleeding and blistering'.

So, where else could I look? Fortunately, Dr Jonathan Pereira, later of Pharmaceutical Society fame, had published the two parts of his *Elements of Materia Medica* in 1839 and 1840, a mere blink of an eye, at 12 to 13 years previous, when compared to Galen.[8] The first problem came on only the second page of the preface, where he stated that although he was well aware of the vast superiority of a physiological or therapeutical arrangement of medicines as a form of classification, he was of the opinion that pharmacologists were too imperfectly acquainted with the operation of therapeutical agents to make this a success, and that any such classifications were in reality

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based on prevailing medical doctrines of the day, or on the peculiar notions of the writer.

In defining pharmacology he divided it into three parts: Pharmacognosy; Pharmacy (collection, preserving and preparation); and Pharmaco-dynamics (today's pharmacology), and it did not take long to realise why all of the problems arose in this third sub-division. In discussing the 'mode of action of medicines', Pereira again divided them into three parts: Mechanical; Chemical; and Dynamical. Since the majority of items in the Materia Medica could not be placed solely in Mechanical or Chemical a third division Dynamical had to be admitted. Similarly, in discussing the nature of actions induced by medicines, we again find three classes: Stimulants; Contra-stimulants or sedatives; and Alteratives. This last group was neither stimulant nor contra-stimulant and again included 'nearly the whole of the articles comprising the Materia Medica'. Pharmaco-dynamics appears to have been a subject of theories and ideas, effectively a series of arguments within itself.

It was interesting that Pereira actually quoted Hahnemann's *Organon* in support of his own opinion that the pure effect of a medicine could only be ascertained on the healthy human body, because symptoms of disease mingling with the effect of the drug would make it much more difficult to ascertain the pure effect of the drug alone. Only with an understanding of the pure effect of the drug could come an understanding of how the *drug's* action was modified by the *disease*. Fortunately Pereira devoted a complete section to his interpretation of homoeopathy. In it he separated the use of medicines into the homoeopaths' three divisions of Antipathic, Homoeopathic and Allopathic, and covered almost six pages with his observations. Under Antipathic (use of medicines that produce an effect opposite to that of the disease), the important point appears to be the differentiation between primary and secondary effects. For example the use of a purgative to produce an evacuation (primary effect) is followed by a period of constipation (secondary effect). Since the secondary effects, according to Hahnemann, were always injurious one should use no larger dose than was absolutely necessary. Thus, part of the explanation for very small doses in his section on homoeopathy (effect of medicine being similar to the disease). His section on Allopathy (effect of medicine being neither opposite nor similar to the disease) centres around cure by 'counter irritation' and provides no conclusive argument.

However, in the homoeopathy section he does attempt to provide some detail in summarising his own opposition to it. In the first of four paragraphs he quotes specific drugs with known, repeatable effects. He cites sulphur, a treatment for scabies, as being incapable of producing scabies, although Hahnemann asserts that it is capable of producing an eruption analogous to it. He quotes the researcher who took the 'requisite quantity' (presumably the standard dose) of quinia without acquiring intermittent fever (i.e. the drug did not produce an effect similar to that to be cured) and stressed the benefits of the drug in cases of the ague. Hahnemann apparently asked 'are the patients really cured in these cases?', but Pereira gives no explanation of the question, simply countering with the fact that the patient surely knows if he is well or not. Finally, in this paragraph, is a simple fact: 'Acids and vegetable diet cure scurvy, but I never heard of these means causing a disease analogous to it'.

Let's for the moment be a little naïve: pre-1754 scurvy was the scourge of the navy, merchant shipping and even armed forces in foreign fields; in 1754 James Lind showed that lemon juice cured scurvy; post-1754 - no scurvy. Maybe unrealistic, but the point is that he was quoting a known, repeatable effect and no one could say that one's regular 'five a day' would produce or simulate scurvy. The problem is what did 'Acids and vegetable diet' mean? Fortunately, in Vol. II the section on Lemon Juice has under 'uses' the heading 'as an Antiscorbutic': 'Lemon Juice has long been regarded as an invaluable antiscorbutic; but on account of the difficulty of preserving it, crystallized citric acid is usually substituted'. Another 92 years would elapse before the isolation of ascorbic acid, but if we could persuade him to drop any reference to acids we might be able to allow the point.

Pereira's opinion in the second paragraph was that in many instances homoeopathic remedies (like added to like) could only increase the original condition, apparently forgetting his own conviction that the doses were too small to have any effect whatsoever. His third paragraph is again purely personal opinion, in which he was totally dismissive of minute doses or of any power being transferred by rubbing or shaking during preparation of homoeopathic medicines. He attempted, finally, to give examples of experimental evidence, but only in so far as quoting examples of tests using homoeopathic medicines, all of which he quotes as failing. He gave no indication of the effectiveness of traditional medicine in similar cases, nor was there any counter-evidence from the homoeopaths.

Back to the original question, re-worded with hindsight. Could either party justify its position based on pharmaco-dynamics? I think that even Dr Pereira would say 'Not a chance'. It would appear that arguments could only be based on observable facts and outcomes, but the real argument would come in the interpretation of those facts against the background of very strongly held opinions.

This was my very brief encounter with early 19th C pharmacology, probably with questionable concl-usions, but an extremely enjoyable exercise.

This paper was presented at the BSHP Annual Spring Conference, 5th April 2008.

Author's address: TandCWhaley@trol4.fsnet.co.uk

Endnotes and References

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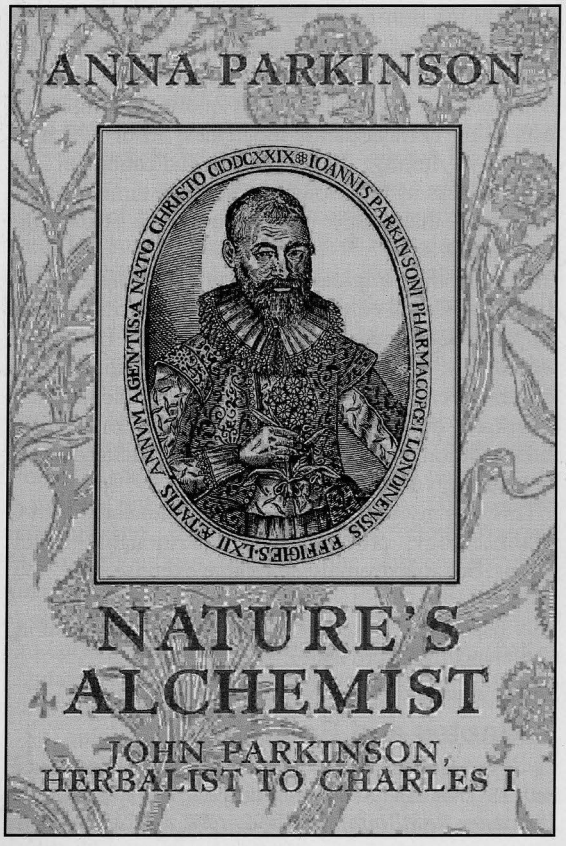
Continued from p. 17

Book review: *Nature's Alchemist*

herbal. Far greater in scope and accuracy than his fellow apothecary Thomas Johnson's update of Gerard's *Herbal* (1633), Parkinson eventually published his monumental study, *Theatrum Botanicum. The Theater of Plantes,* in 1640 at the incredible age of 73. Its appearance led directly to King Charles conferring on him the title of *Botanicus Regius*, or Royal Herbalist, 'in recognition of his significant contribution to the welfare



of the people'. A human variant of alchemical ennoblement, it was the accolade Parkinson had coveted for a quarter of a century; moreover, this weighty tome was to prove essential reading for doctors and apothecaries for more than a hundred years.

However, when John Parkinson died in 1650 his life was in ruins, destroyed by the Civil War. He had lost everything: 'his home, his garden, his family, his king and his country.' He bequeathed nothing to posterity except his two books and a small bundle of personal papers which is in a collection left to Magdalen College, Oxford, by John Goodyer, one of Parkinson's earliest and closest friends. Intrigued, and appalled by the speed with which he had sunk into obscurity, Anna Parkinson embarked on a personal quest to find out about this man to whom, family myth maintained, she was distantly related. Meticulously researched, her very readable and evocative biography succeeds in re-creating, if somewhat fancifully in parts, the life and times of this very English apothecary who achieved so much but about whom so little is known.

An unusually well-educated Lancashire lad from a humble farming background, John Parkinson travelled to London to find fame and fortune and never ventured beyond its boundaries. On completing his apprenticeship to apothecary Francis Slater in 1592 he became a freeman of the Grocers' Company; he married a widow (going on to have a family of his own), took on an apprentice in 1594 and opened a shop the same year on the south side of Ludgate Hill, just outside the city gate. Parkinson then quickly established what became an internationally-renowned garden and plant research centre within easy walking distance of his business premises. He was later to experience the major trauma of defecting from his mother company to become a founding member of the Society of Apothecaries in 1617 and its Renter Warden in 1620/1. Parkinson's ever-increasing knowledge and expertise enabled him to move in very elevated medical, botanical and Court circles and facilitated the networking opportunities he valued so highly with both English and continental apothecaries, botanists, physicians and merchants. And like many others (including his contemporary, the poet John Donne), he suffered great personal, professional, family and economic disappointments and hardship during the long and turbulent decades of anti-Catholic fervour, and the consequent social and political upheavals, of this period in England's history.

Anna Parkinson, a journalist and former BBC producer, has written an attractively illustrated, sensitive and sympathetic biography of her ancestor which both glows with obvious pride in his accomplishments and achievements as well as demonstrating her strong sense of affinity with him and his life's work.

Dee Cook, Archivist, Society of Apothecaries

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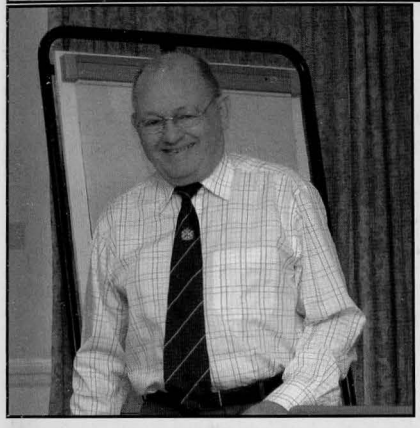
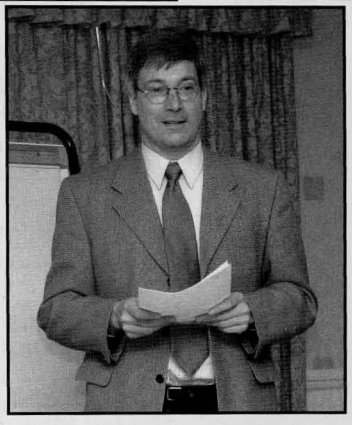
Spring Conference, Reigate 4-6 April 2008





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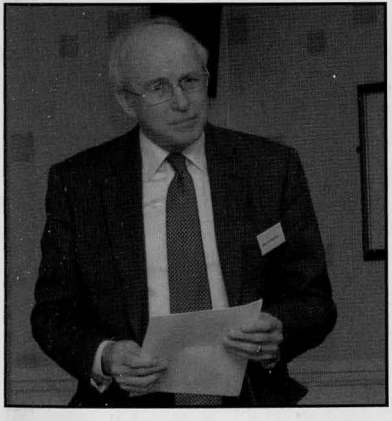

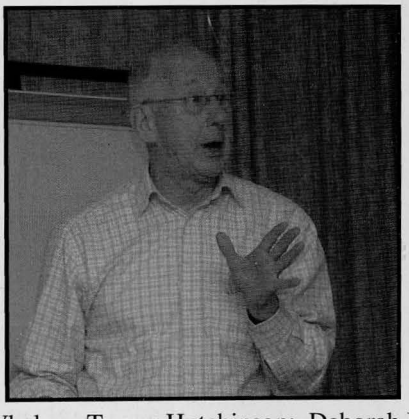

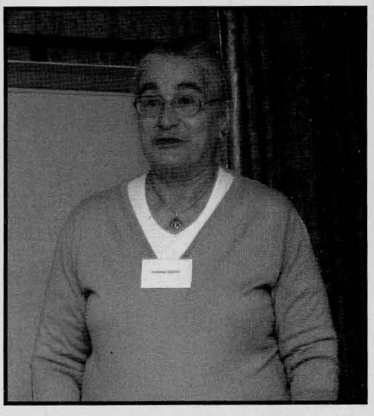

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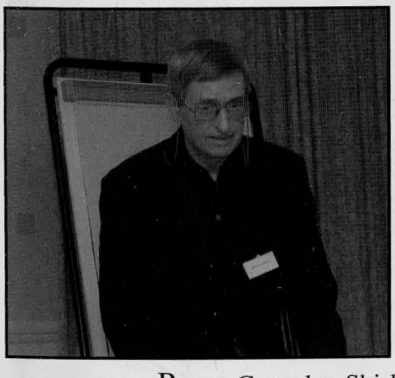

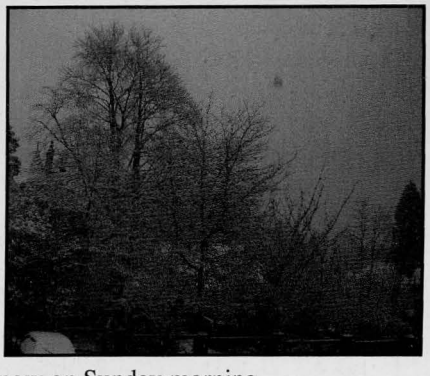

Renzo Console; Shirley Ellis, Conference organiser; Snow on Sunday morning

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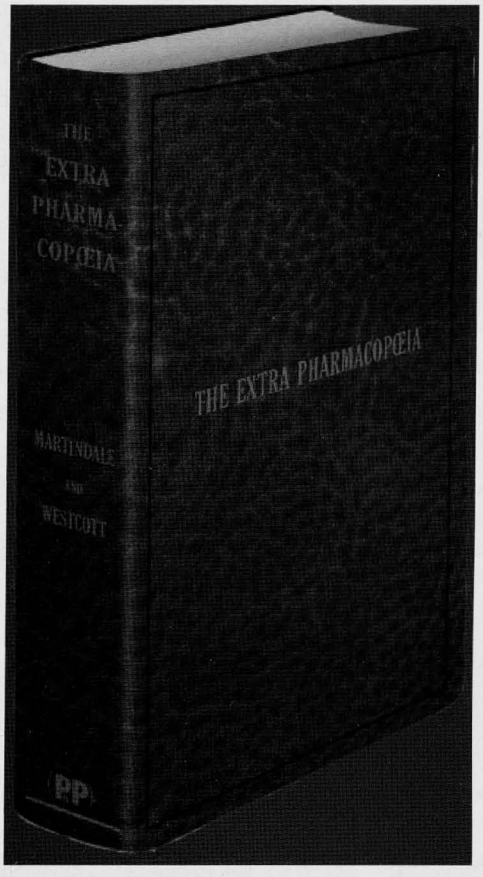

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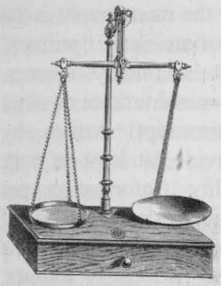

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Diary

Wednesday 24 September 2008
'The History of Aspirin' by Mr Diarmuid Jeffreys. Lambeth 6.30 p.m.

Wednesday 19 November 2008
'Thomas Mott Caton: the life and times of an early 19th century local London apothecary' by Dr G Clein. Lambeth 6.30 p.m.

Wednesday 11 February 2009
'The History of Allergy and its Treatment' by Prof. Mark Jackson . Lambeth 6.30 p.m.

Wednesday 6 May 2009
'Medicine and Pharmacy: a twentieth-century postcard History' by Dr John Crellin. Lambeth 6.30 p.m.

Further Dates 2009: Wednesday 23 September; Wednesday 4 November.

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Call for contributions from members.
As this area of the Lake District is famous for its literary connections I thought it would be a good idea to make the main theme for the conference 'pharmacists or pharmacy in literature, ancient or modern'. If you would like to give a short presentation (15 minutes plus questions) on this or on a pharmacy or pharmacist from the locality please let me know.

Papers are also welcome on any pharmacist, or pharmacy, whose contribution to the profession in the past you think members should know about. If you would like to contribute a paper at the conference please contact Shirley Ellis at 1 Willow Way, Bottisham, Cambridge CB25 9BS or by e-mail to *ellisbottisham@compuserve.com* giving your details and a title for your contribution. Closing date 30 November 2008.
Shirley Ellis has also been considering alternatives to the quiz for Saturday evenings and wondered whether a poetry reading by a professional would be of interest. Please let her know and if your answer is in the affirmative perhaps you could identify a poem, or poems, you would like to see included. Also would you prefer members to read the poems rather than an actor?

RPSGB Museum Takes the Public Behind the Scenes
The Museum of the Royal Pharmaceutical Society of Great Britain (RPSGB) is inviting people to get a dose of history with its new 'Behind the Scenes' initiative. These brand new sessions have been designed to encourage people from the local community to get up close to the Museum's collection. Ten sessions will be hosted from August through to December, with the Museum exploring a new theme each month. The following sessions will take place:

Lambeth's Links with Pharmacy, 6 August, 2-3pm & 21 August, 6-7pm
Making Medicines, 3 September, 2-3pm & 18 September, 6-7pm
Medicine Chest, 1 October, 2-3pm & 16 October, 6-7pm
Old Photographs, 5 November, 2-3pm & 20 November, 6-7pm
Christmas Cold Cures, 3 December, 2-3pm & 18 December, 6-7pm

The initiative forms part of an 18-month Audience Development Programme, funded by the Heritage Lottery Fund. The project targets three key audiences: pharmacy students and lecturers; primary and secondary school students, and London-based adults.To find out more about the Behind the Scenes sessions, or to book your place, please contact the RPSGB's Museum on 0207 572 2210 or email museum@rpsgb.org

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'Traditional Use' Claims for Herbs: The Need for Competent Historical Research

Dr John K Crellin
Newfoundland, Canada

The intention of this article is: (i) to make clear that 'traditional use' claims for herbal medicines, sanctioned today by various regulatory bodies, demand critical appraisal; (ii) to emphasise that historians of pharmacy, with a special interest in drugs, have an important role in such appraisals, and (iii) to outline key considerations for evaluating claims.

Traditional use claims are often made for herbs in authoritative monographs and texts without adequate documentation.[1] Ready appraisal of such claims – which can be based on usage varying from 'three generations' (interpreted as 75-100 years) to 'thirty years' – can be problematic even to deciding whether any hidden health issues are involved.[2] Such matters are spotlighted in recent Natural Health Product (NHP) monographs published, with documentation, by the Natural Health Products Directorate (NHPD) of Health Canada.[3] I use questionable quarrying of 'traditional' herbal information in monographs to promote discussion on the general quality of traditional use claims in all jurisdictions where the evidence is not transparent.

The Canadian monographs, arising from Natural Health Product Regulations that came into effect on 1 January 2004, are designed to improve the quality and efficacy of marketed natural health products (herbal remedies, homeopathic medicines, vitamins, minerals, traditional medicines, probiotics, amino acids and essential fatty acids).[4] A manufacturing company that follows monograph specifications in its pre-marketing application for a mandatory natural health product number will have a speedier evaluation. However, in failing to provide adequate evidence to support the level of 'reasonable certainty' of evidence – often used to justify claims of traditional usage – the NHPD statement that the monographs 'serve as *reliable* [emphasis added] sources of product information for consumers' can be challenged.[5]

Some may see questions about errors and debatable interpretations as nit-picking because the NHP regulations do provide a new level of quality control for self-care products considered inherently safer than pharmaceuticals. However, this not only sidesteps the potential to mislead public expectations and unresolved concerns over effectiveness and safety of herbs in everyday usage, but also lessens confidence that government authorities are providing the best possible information.

Part 1: Illustrations of Problems and Issues

This part, in documenting issues, examines: (i) a representative monograph, and (ii) the NHPD guidance document as it relates to traditional use claims. The data behind the summary statements plus other examples can be found in an Appendix (see note 1).

An overarching issue raised by the monographs is the inconsistent use of what historians call 'primary' references compared with recent 'secondary' sources. 'Primary' covers printed books, journal articles or other material (published or in manuscript) written by knowledgeable authors who provide, at least in part, authoritative comment, originality (information not available elsewhere that may correct or add to work of others), first-hand witness of trends or events, or even a reflection of the history of the times. 'Secondary' sources, commonly recent compilations, are less useful for such features; certainly those generally used by NHPD and the herbal literature do not critically appraise historical resources in the way they often do with modern studies.

Aside from a limited selection of primary references (none in some monographs) and inconsistent and questionable use of secondary sources, particularly troublesome are the erroneous citations and the partial or misleading quotes.[6] One widespread issue is failure to check references (where provided) in secondary sources. For example, D. E. Moerman's *Native American Ethnobotany* (1988) is an invaluable compilation from innumerable publications.[7] However, citing the work for specific usage needs a critical approach to the references used by Moerman, which are variable in authority and quality, and thus raise questions of interpretation over, for example, correct plant identification.

A need also exists to appreciate that secondary source misinterpretations of primary sources can extend to temptations (i) to dismiss information in primary sources that does not 'fit' current herbal interests or (ii) to 'read into' older texts support for current views. Black cohosh is noted below as an example where NHPD finds questionable traditional support for the current interest in using the herb for menopausal and premenstrual symptoms.

A NHP monograph: Black Cohosh[8]

Excerpts from monograph (quotes from the monograph are boxed; the bold numbers correspond to those used in the comments.)

Comments

NHP traditional claims

[1] '*Traditionally used (in Western herbalism) to help relieve menopausal symptoms (Ellingwood 1983 [reprint of 1919]; BPC [British Pharmaceutical Codex] 1934; Lloyd 1921).*'

[2] '*Traditionally used (in Western herbalism) to help relieve premenstrual symptoms (Ellingwood 1983 [1919]; Felter and Lloyd 1983 [1898]; Lloyd 1921).*'

[3] '*Traditionally used (in Western herbalism) to relax skeletal muscle and ease nervous tension (Ellingwood 1983; Felter and Lloyd 1983; Lloyd 1921).*'

'Traditional uses:

Dose(s) [Traditional]

[4] *300-3000 mg dried root or rhizome per day (Williamson et al. 1988; Ellingwood 1983; BPC 1934)*'

[For references see note[9]]

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Erroneous citations

[1] Lloyd makes no specific mention of menopause. He notes use for 'diseases of women,' but as did other authoritative writers, he probably referred to amenorrhoea and dysmenorrhoea.

[2] Lloyd provides no specific reference to premenstrual symptoms.

Partial or misleading quote

[4] The dosage is not supported directly by the citations. The monograph weaves together information and adds 'per day'. In fact, Ellingwood gives *no* dosage for dried root, noting only extracts, tincture and a specific Eclectic remedy (Macrotys), while recommending different preparations for different conditions.

Particularly problematic is the high dose of 3000 mg (not supported by references) when read in the context of (i) the non-traditional dose given in the monograph of 40-200 mg and (ii) such properties noted in the nineteenth-century literature as slowing pulse rate, and, as one author wrote in 1884, that it was employed 'in cardiac disease, where it acts like, but less efficiently than, digitalis'.[10]

Debatable interpretations

[1] Ellingwood refers to 'hysterical conditions of the menstrual epoch in hypochondriasis or melancholia at these times, with congestive dysmenorrhoea'. This quote is excerpted from a wide range of recommendations – from the premonitory stage of acute fevers, to chorea, to acute rheumatism and rheumatic fevers. It is unclear whether Ellingwood's 'epoch' refers to menopause. Elsewhere in his book, the term more clearly refers to menstrual cycles, whereas in places he specifically notes 'menopause', e.g., for valerian: 'nervous disturbances incident to the menopause'.

[1] The BPC (*British Pharmaceutical Codex*) refers to '*supposed* action in various uterine disorders' (emphasis added) with no specific indication for menopause. In fact, the reference to 'supposed action' suggests scepticism or declining interest even for the more widely accepted recommendations for 'amenorrhoea and dysmenorrhoea, and neuralgic pain of the uterus and ovaries', conditions specified in the *BPC 1923* but omitted from the 1934 edition.

[2] Although some historians might interpret Ellingwood's 'hysterical conditions of the menstrual epoch' (see [1] above) as premenstrual symptoms, that interpretation is unclear in many other contemporary accounts of black cohosh. Felter and Lloyd note 'painful conditions' incident to imperfect menstruation, i.e., 'restoration of suppressed menses' (amenorrhoea), rather than premenstrual symptoms.

In reading modern terminology into the older texts, it has to be appreciated that current concepts of premenstrual tension only emerged in the 1930s (in part due to new knowledge of hormones), while the sense of it being a medical/social problem became even more firmly established with (a) the later terms of premenstrual syndrome ('PMS') and 'late luteal dysphoric mood disorder', and (b) its use as a criminal defence (including for murder) in the early 1980s. As a medical problem PMS attracted new treatments, including herbs with no clear traditional evidence of effectiveness.[11] It is relevant to note that, despite monograph claims, efficacy remains debatable.[12]

[3] While Ellingwood's reference to 'muscular aching' can be read in the context of a concept he proclaimed – 'an efficient nerve sedative, although its most pronounced action is on the unstriped muscles' – this is a conceptual rationalisation. The plant's reputation on rheumatism was accounted for in a number of ways that do not support the comment on muscle relaxant activity, nor does the citation to Felter and Lloyd who note use for 'muscular pain of a rheumatoid character'. Lloyd (1921) does refer to a report of a sedative action, though this is in the context of lessening the 'frequency and force of the pulse', and for soothing pain and allaying irritability.[13] Another author around the same time (1884) also indicates sedative action, but in 'very large doses . . . causing vertigo, dilatation of pupil, and a tendency to somnolence'.[14] Without clear reference to preparation and dosage, the monograph recommendation is problematic.

Summary comments. Besides the issue of heavy reliance on the Eclectic medical textbooks (see comments below on primary sources) and the possibility of the current promotion of black cohosh biasing interpretation, a further feature of the monograph is that it allows both traditional and non-traditional claims that black cohosh relieves premenstrual and menopausal symptoms. The resulting uncertainty is surely signalled by the different non-traditional and traditional dosages for the same conditions.

The NHP guidance document[15]

Intent of document

Given the issues just outlined, the published guidelines that presumably shape the monographs are of general interest if only because they lead to the question: Can regulatory authorities serve two constituencies, the public and industry? The guidelines state:[16]

> The intent of this document is to ensure that the [monograph] requirements are rigorous enough to protect public health and increase consumer confidence, yet flexible enough for industry to develop useful NHPs while accommodating changing scientific developments.

What level of information, then, is considered appropriate for the public: minimal, overly simplified, or comprehensive with public education in mind? Moreover what definitions of traditional medicine are followed? NHPD follows the lead of the World Health Organization Traditional Medicine Program:

> the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, used in the maintenance of health, as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness.

However, NHPD sets limits on the 'sum total of knowledge' through effectively circumscribing the meaning of 'traditionally used' by accepting a short history of 'at least 50 consecutive years of traditional

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use' (albeit longer than EU regulations). Perhaps NHPD, like other authorities, feels some latitude in interpretation is justified, since the term 'traditional' often tends to be used loosely. Sometimes, it is synonymous with folklore: the beliefs, legends, and myths associated with the 'common people'. On the other hand, while the transmission of beliefs through time is a recognised feature of folklore, *continuity* is more commonly viewed as a key part of being 'traditional', that is knowledge built up, handed down, and 'evaluated' through generations of experience. Scientists study traditional medicine nowadays for new drugs on the assumption that empirical knowledge of usages survives from one generation to the next, such that a reasonably good chance of effectiveness exists.

NHPD's rationalisation for a history of 'at least 50 consecutive years' within 'a cultural belief system or healing paradigm' is that two generations allow 'possible reproductive side effects to be identified'. Yet the ability to recognise 'reproductive side-effects' – or for that matter other adverse reactions – is related to the type and dosages of a preparation employed. Important, too, is an extended period of time, since, when herbs had their widest usage within Western health care, side-reactions (apart from known toxicities) were not systematically recorded as distinct from general effects; indeed, a general consciousness over unanticipated adverse effects did not emerge into general use until the close of the nineteenth century.

Sources of information

Another issue with the Guidance Document is the limited sources of information that NHPD accepts in an application for a product licence. This may only be a *single* supporting reference if it demonstrates 'pharmacopoeial evidence for traditional use claims'. Although pharmacopoeias generally include products in current usage (albeit not always widespread), they are not therapeutic texts with clinical detail; they are more compendia of drug standards that have national or official legal authority, though that is not the case with the *British Herbal Pharmacopoeia* (1983).

If pharmacopoeial requirements are *not* met, NHPD stipulates that 'at least two independent references' are to be used, 'i.e. references that do not cite the same source, or each other, as the main source of information regarding the traditional use'. Despite various criticisms (predating the new natural product regulations) over allowing only two references, Health Canada has persisted with this guideline despite its violation of minimal standards of historical scholarship.

NHPD also limits, at least indirectly, sources of traditional medicine information likely to be used through its list of 'authoritative' and 'reputable' sources for manufacturers to consult. However, apart from two, they are all from the 1990s and 2000s.[17] Most are valuable compilations, but they are not primary sources as defined earlier, nor do any systematically use or document primary sources for historical information. They generally take traditional uses from writings peer reviewed for scientific, not historical, content. The guidance document, by allowing questionable assumptions, also makes it easy for manufacturers to sidestep its own stipulation of fifty years to uncover adverse reproductive effects. For instance, 'traditional use' is accepted if a reference describes (i) usage in the context of a particular 'cultural belief system or healing paradigm' that has been in existence for at least 50 years, or (ii) includes 'statements that imply a traditional use' (e.g., 'In folklore used as ...').[18] A flavour of the issues comes from an example provided by NHPD of a herb 'used in the time of King Edward II to alleviate coughs'. Even though, NHPD continues, 'neither a concrete date nor time frame is given (e.g. 1284-1330 AD), if the time being referred to is more than 50 years ago, the NHPD will assume that the reference supports a traditional use claim and that the ingredient has been used for at least 50 years'.

This example, with all its assumptions, suggests that, in accepting information from any secondary reference in good standing that cites (maybe from another secondary source) a medieval manuscript, many issues will be overlooked. For instance, difficulties in botanical identification, that the original reputation of a herb or preparation was supported by magico-religious beliefs, by the enthusiasm of one or a few practitioners (including the original author who may have been a lay person with limited medical experience), or by concepts that faded so that the herb had little use even if remembered by herbal writers.[19]

The Guidance Document also prompts questions about NHPD's recommended dosages considered in the appendix (see note 1).

Part 2. Methodology for Uncovering Reliable Information

Criticism of traditional use claims must be constructive so this part offers considerations for those interested in researching the validity of traditional claims.

What exactly is meant by 'traditionally used' in herbal medicine?

Any methodology must be underpinned by a clear sense of what it is trying to accomplish; indeed this is generally necessary before deciding on and examining appropriate literature and other sources of information. A consensus is needed on the meaning of 'traditional herbal knowledge' and on what can be said to have been 'used for centuries'. Although, as said, empirical knowledge is generally understood as being built up and evaluated as it is handed down through generations, it must be appreciated that herbalism in the past was diverse and complex (as nowadays). Despite a definition of traditional medicine as the '*sum total* of knowledge skills and practices', regulatory bodies like NHPD do not make it clear that the use of herbs has accumulated over time by drawing on anecdote, magic, myth, religious teachings, symbolism, 'factual' or empirical observations, and scientific evidence. The selection of information has always varied depending on the practitioner (from 'wise women' and sectarian

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botanic practitioners to licensed physicians), the theories of the time, and patients who selectively choose ideas and practices according to their own concepts of health and disease and their personal situations, and experience.

The reason for noting here the complexity of Western herbalism is to emphasise that it does not mean the absence of overlapping practices among the different schools of thought. *Indeed, the same information from different arenas may point to relatively robust evidence of mainstream usage that may well be indicative of being therapeutically useful for many patients.* The challenge is to uncover this from separate accounts of that can include idiosyncratic suggestions, and the promotion of quacks who offered a cure for every ill, from cancers to strokes. Relevant considerations are given in the next section.

Critical appraisal of primary sources

Any historical investigation needs to evaluate a range of primary sources, the strengths of information in each and pitfalls due to biases etc. To focus, I chose NHPD's heal-all monograph because of its five primary references.[20] (For details on heal-all, see Appendix, note 1). Since space only allows detailed illustrative comments on one of the primary references, my summary includes brief notes on the other four (by Culpeper, Meyrick, Wren and Grieve).

1. Harvey Wickes Felter and John Uri Lloyd: *King's Dispensatory* (1898)

This primary reference is singled out for detailed comment, since it also raises questions about a heavy reliance on a particular school of thought (sometimes called sectarian) botanical medicine, namely the Eclectics. The two authors in their revision of *King's Dispensatory* apparently did not value heal-all highly, for the comment 'once used' is found not in a specific entry on the herb, but as a brief note in an extensive account of Scutellaria.[21] This is especially noteworthy as the *Dispensatory* was a principal text for the sectarian medical practice of Eclecticism that had become noticeable in the United States by the 1850s. It was one of various attempts to reform medicine through employing treatments less vigorous than extensive blood-letting and strong doses of purgatives and emetics that had become associated with conventional medicine. Eclectic medicine, with its own medical schools, remained a factor in the U.S. medical scene until its declining years of the 1920s and '30s.[22] An appreciation of its characteristics is important for evaluating the validity of information in the texts.

In its heyday, Eclectic medical practice was characterised by, for instance:

(i) The use of botanical, especially native North American, remedies (with much faith in empirical 'practice', sometimes taken from other schools of medical practice).

(ii) Concepts that included specific Eclectic medical preparations. For instance, (a) 'concentrated' remedies e.g., resins, resinoids, oleoresins, until these were generally replaced by (b) single herb medicines marketed under the doctrine of 'specific medications'. The latter were based on a concept that certain well-defined symptoms would be corrected by a particular medication. Such preparations, specially manufactured for Eclectic practitioners, were intended to contain the active principles minus inert constituents. Unfortunately, the formulae and method of preparation were not made public.

(iii) A large body of literature on materia medica. Much of this has recently become prominent again (as printed and digitised reprints) and selectively drawn on as part of current herbalism, which some see as neo-Eclecticism.

No one will deny that quality empirical evidence exists in the Eclectic materia medica/therapeutic literature. However, careful interpretation of therapeutic recommendations is needed because of (i) possible biases inherent in the Eclectic reform ideology and its evangelical promotion of botanicals as alternative practice, (ii) some clinical experiences related to the use of the specific Eclectic remedies of unknown composition, and (iii) lists of uses that went far beyond those found in other arenas of herbal medicine. Since NHPD does not justify its selection of usages from the cumbersome therapeutic lists in Felter and Lloyd (or in two other books, one by a further well-known Eclectic writer, Finley Ellingwood, and another by Lloyd), it is questionable whether these, representative of only one thread of herbalism, should be relied on so heavily. (Eclectic citations are also heavily used in the black cohosh monograph already considered.)

2. Other primary references

The dates (1652, 1789, 1898, 1907, and 1932) of the five primary sources used in the heal-all monograph might suggest evidence of consistent usage over time. However, a close examination indicates that, as in other monographs, historical sources are unsystematically cherry-picked. Why, for example, is Felter and Lloyd used to document certain uses and not others on which they also comment? In the heal-all monograph, despite references to more than two primary sources (NHPD's minimum) for at least one claim, no attempt is made to ensure a judicious selection of sources or to avoid taking information out of context. For instance, although Nicholas Culpeper's *The English Physitian* is probably the best known 'herbal' of all time, care is needed in evaluating its information for self-care today. NHPD ignores, for example, Culpeper's statement that heal-all is under the influence of Venus; although this omission may be justified, differing opinions over interpreting Culpeper have to be evaluated, as should other concepts of his time, e.g., the need to ensure a correct balance of humors – that can justify usage based on theoretical grounds alone.[23]

Maud Grieve's *A Modern Herbal* (1931) is another popular herbal. As an edited compilation of Grieve's writings by Hilda Leyel, who also added many entries, it contains much general information, sometimes on

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cultivation details – a reflection of Grieve's promotion of herbs as part of the 1914-18 war effort. Although the *Herbal* contains valuable first-hand observations on then current usage, especially of herbs grown in England, this does not apply to all entries, and therapeutics is not the strongest part. Thus careful interpretation is needed when evaluating (i) whether theoretical considerations such as the doctrine of signatures (which Leyel did not reject) underpinned some suggested reputations, or at least sustained theoretical interest in little-used herbs, and (ii) whether historical quotes – ostensibly included for general interest as 'former' usage – are sometimes read uncritically into a current recommendation, as when Grieve quotes Culpeper on heal-all.

It is especially difficult to understand why citations to William Meyrick's *Herbal* of 1789 are parachuted into the monograph, even though it is a useful volume for the historian. It was written for 'families', as were many writings on domestic medicine of the same vintage of far greater authority and influence than Meyrick's, for instance, William Buchan's *Domestic Medicine* and Samuel Tissot's *Advice to People in General, with Respect to their Health.* Meyrick, a surgeon, claims 'unquestionable authority, or confirmed by actual experiments' for his therapeutic claims, but critical interpretation of his remarks does need to consider whether concepts such as astrology might be at play.[24] Moreover, while incorporating the works of others, he omitted some eighteenth-century writers on materia medica, representative of conventional practice, such as William Cullen, who must be considered a more critical authority of the time.

If NHPD's choice of the first edition of R.C. Wren's *Potter's Cyclopaedia of Botanical Drugs and Preparations* (published by Potter & Clarke, wholesale botanic druggists and manufacturing chemists) is intended to capture a non-Eclectic medical tradition then it is a surprising choice. Although it was written for those engaged in 'medical and pharmaceutical pursuits who are so often called upon the give particulars regarding the use and employments of Herbs, Roots, Barks &c., it had the character of an aide mémoire. Appearing at the time when many 'pocket-size' texts for the medical and pharmaceutical profession were being published, readers were expected to have some knowledge of herbs in order to interpret the synoptic information, perhaps a reason for NHPD's misquotes.[25] While a useful resource for the historian, the work is far removed from the detailed and therapeutically useful mainstream materia medica/therapeutic texts published at the time.

In bringing together all the information on heal-all, leaving aside Culpeper's comment on the influence of Venus on the plant, it seems its reputation rested mostly on its astringent properties. The latter was linked to the strength of the preparation, and a reference by Meyrick to the use of juice is noteworthy, albeit omitted by NHPD; at the same time he hinted that interest in heal-all had faded since wound herbs were no longer held in esteem, as they were in Culpeper's time.[26]

Undoubtedly, evaluating the strength or weakness of the traditional reputation must consider whether, like many herbs, uses were postulated from the level of astringency (including styptic action) of tannin constituents, and on a lingering coat-tail effect of the once general interest in astringent herbs to treat wounds. Certainly the lack of enthusiasm by Felter and Lloyd is, as noted, telling – all the more so as other writers also reflect a weak tradition. As in many cases of traditional use claims, this illustrates the type of assessment generally omitted in secondary sources and useful for public information.

Summary of methodology

A key component of an appropriate methodology, as already noted, is the need for a consensus on what is to be accomplished to meet the definition of the 'sum total of knowledge skills and practices based on the theories, beliefs and experiences indigenous to different cultures'. In approaching this I have indicated the importance of careful evaluation of primary sources. To this I add other comments.

To reach a level of 'reasonable certainty' about the effectiveness of a herb or herbal product for a significant proportion of the population, documentation needs to show evidence of positive experiences beyond lone case histories, which may rest on idiosyncratic observations (often linked to a theory that postulated a particular usage, on placebo responses and/or *post hoc ergo propter hoc* arguments). One way of looking at this is making clear that it is more than a series of anecdotes by reaching a level of what can be called *anecdotal knowledge*; this can be defined as a *pattern* of observations that, by being drawn from different practices and schools of thought and evaluated over time, minimise biases.

Finding patterns of information

In developing an adequate range of sources for uncovering patterns, many accounts, like the NHP monographs, fail to use adequately the largest body of literature on herbs (much appearing under the heading 'materia medica') published by conventionally trained medical and surgical practitioners. Granted much diversity existed among 'conventional' practitioners (many incorporated homeopathy and Eclectic medicine), but, within the medical literature, a history of careful efforts exists to evaluate the effectiveness of herbs. Some of this, certainly in the seventeenth century, was driven by the well-known conflicts between supporters of new chemical medicines and those who favoured older knowledge of plant remedies/regimens. Biases, therefore, from special interests have to be looked for, though it is wrong to assume that this particular issue continued to influence all physicians in the nineteenth century.

It is too simple, as is so often done, to chastise conventional nineteenth-century treatment as being

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solely heroic blood letting, purging and vomiting. Much more critical approaches, including limited clinical trials and experimental studies, are clear from numerous textbooks from the eighteenth century onward that are not slavishly copied from one to the other. While empirical evidence was respected, its quality was constantly evaluated. Authors writing in English who, to a greater or lesser extent, fulfil this over a long period of time include William Cullen, William Woodville, Robley Dunglison, Jonathan Pereira, George B. Wood, Roberts Bartholow, George Butler and many others, none mentioned by NHPD.

Ideally, the search for traditional knowledge should also evaluate relevant manuscript sources (e.g., physician case books) and sources for documenting the oral tradition. Textbook teaching is not necessarily reflected in everyday practice. Differences can be found in how a herb is used (e.g., powder, infusion (cold or warm), decoction, etc.) and whether used singly, or, as more generally the case, in multiple ingredient prescriptions with other constituents intended to enhance activity (e.g., honey for sore throats). Sometimes manuscripts illuminate the evaluation of empirical knowledge more than published herbals that are consciously underpinned by concepts current at the time.

Conclusions

The evidence I have outlined, and many more examples could be given, prompts questions whether most current traditional use claims are a guide to high probabilities of relieving symptoms and hence justifying a patient's time and costs. There is an absence of transparent scholarship behind claims. Undoubtedly regulatory bodies are under various influences and pressures. For example, apart from being bounded by existing government regulations, difficulties exist in providing accurate and succinct labels. Nevertheless that does not absolve any authority, when sanctioning traditional uses for self care today, from demonstrating sound scholarship. Historians of pharmacy are in a good position to be watchdogs.

Acknowledgements

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Author's address: jcrellin@mun.ca)

Endnotes and References

1. Still widely referred to are the unreferenced German Commission E monographs (an English translation is available), while most herbal reference books cite secondary sources for traditional claims. For full details on this see an Appendix to this article available from the author (jcrellin@mun.ca), which tabulates data in the monographs noted below (plus additional examples) with direct quotes from the cited authorities. It is appropriate to add that the frequency of monograph revisions can be confusing for manufacturers.

2. For use over 'three generations': *Australian Regulatory Guidelines for Complementary Medicines*, Part IV, section 3 <http://www.tga.gov.au/docs/html/argcm.htm> accessed April 2008; for 30 years. U.K.: Statutory Instrument 2005 No. 2750, *The Medicines (Traditional Herbal Medicinal Products for Human Use) Regulations 2005.* <http://www.opsi.gov.uk/SI/si2005/20052750.htm> accessed April 2008 (see also key requirements for registration <http://www.mhra.gov.uk/home/idcplg?IdcService=SS_GET_PAGE&nodeId=595 >. The U.K. registration is based on European Directive 2004/24/EC of the European Parliament and of the Council of 31 March 2004 amending, as regards traditional herbal medicinal products, Directive 2001/83/EC on the Community code relating to medicinal products for human use.

3. All monographs can be found through Health Canada. Single Ingredient Monographs (introductory remarks). <http://www.hc-sc.gc.ca/dhp-mps/prodnatur/applications/licen-prod/monograph/mono_list_e.html> accessed April 2008.

4. Relevant information: Health Canada. *At a Glance: A Regulatory Framework for Natural Health Products.*< http://www.hc-sc.gc.ca/dhp-mps/prodnatur/about-apropos/glance-apercu_e.html> accessed April 2008.

5. The term 'reasonable certainty' is often found in the literature (sometimes as a 'doctrine') to describe evidence from the historical record in lieu of clinical trial data. I suggest this can only be justified if appropriate methodology is followed. For quote on reliability, see Health Canada. Single Ingredient Monographs introductory remarks (note 3).

6. Representative examples appear in Appendix (see note 1).

7. Portland: Timber Press; available and updated on the Internet: <http://herb.umd.umich.edu/ > accessed April 2008.

8. <http://www.hc-sc.gc.ca/dhp-mps/prodnatur/applications/licen-prod/monograph/mono_cohosh-grappes_e.html> dated 28 March 2007, accessed April 2008.

9. For citations: Ellingwood F. *New American Materia Medica, Therapeutics and Pharmacognosy*. Evanston, 1919 reprint 1983), also available: < http://www. henriettesherbal. com/eclectic/ellingwood > accessed April 2008. Felter HW and Lloyd JU. *King's American Dispensatory*. Cincinnati, 1898 reprint 1983), also available: <http://www. henriettesherbal.com/eclectic/kings/cnicus.html> accessed April 2008 ; Lloyd JU. *Origin and History of all the Pharmacopeial Drugs, Chemicals and Preparations with Bibliography. Volume 1. Vegetable Drugs.* Cincinnati, 1921. This is a poor choice of reference given that, as hinted in the title, it is not intended as a work on therapeutics.

10. Johnson L. *Manual of Medical Botany of North America.* New York: Wood, 1884, p. 69. Granted it is unclear whether NHPD would accept 3000 mg as a single rather than divided dose (see Appendix, note 1).

11. For some discussion, Rittenhouse CA. *The Emergence of Premenstrual Syndrome: The Social History of a Women's Health Problem.* PhD University of California, San Francisco, 1989; Rodin M. The Social Construction of Premenstrual Syndrome. *Social Science and Medicine* 1992; 35: 49-56.

12. For recent comment on this: Reed S, Newton M, LaCroix A. Vaginal, endometrial, and reproductive hormone findings: randomized, placebo-controlled trial of black cohosh, multibotanical herbs, and dietary soy for vasomotor symptoms: the Herbal Alternatives for Menopause (HALT) Study. *Menopause* 2008; 15: 51-58.

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13. Lloyd (note 9), p. 62.
14. Johnson (note 10), p. 69.
15. Health Canada, *Evidence for Safety and Efficacy of Finished Natural Health Products. Natural Health Products Directorate Guidance Document,* dated December 2006, section 1.2, <http://www.hc-sc.gc.ca/dhp-mps/prodnatur/legislation/docs/efe-paie_e.html> accessed April 2008. Henceforth quoted as *Guidance Document.* Unless otherwise stated other references to the document in this paper are to section 2.2.1, titled 'Traditional Use Claims'. Omitted for comment here because of lack of space are points in the Guidance Document such as the role for expert opinion and of oral reports.
16. Ibid. Introductory section.
17. Ibid. Appendix on 'Examples of Useful References. The following resources may be useful in the literature search for safety and efficacy evidence. 'References to Traditional Use.'
18. This presumably justifies NHPD's reliance on recent secondary sources that, for example, state, without documentation: 'in folk medicine, the drug is used . . .' For example, such a phrase is used in Bisset and Wichtl. *Herbal Drugs and Phytopharmaceuticals*. Stuttgart: MedPharm, 1994, p. 284.
19. For discussions on issues and aspects of methodology, see: Riddle JM. Research Procedures in Evaluating Medieval Medicine. In Bowers B (ed.) *The Medieval Hospital and Medical Practice*. Aldershot: Ashgate, 2007. In a private communication Riddle has pointed out that in King Edward's time sources were unlikely to have come from 'a medical writer or even one with medical knowledge'.
20. The references are: Culpeper N. *The English Physitian or Astrologo-Physical Discourse of the Vulgar Herbs of the Nation*. London, 1652; Meyrick W. *The New Family Herbal; or Domestic Physician*. Birmingham: Pearson and Rollason, 1789. Albeit an interesting work that was 'intended for the common use of families of every description'; perhaps NHPD's reason for using it is because of its ready availability on the Internet; Felter and Lloyd (note 9); Wren RC. *Potter's Cyclopaedia of Botanical Drugs and Preparations*. London: Potter & Clarke, 1932, p. 167. (Therapeutic information unchanged from 1907 edition quoted used by NHPD); Grieve M. *A Modern Herbal* (ed., Leyel CF). New York: Dover, 1971 (facsimile reprint of 1931), 2 vols.
21. Heal-all is listed as a 'related species'.
22. For historical perspectives on the Eclectic medicine in the context of the nineteenth-century sectarian botanical movements, at least in America: Berman A and Flannery M. *America's Botanico-Medical Movements: Vox Populi*. New York: Haworth Press, 2000, pp. 111-144.
23. Differing opinions include whether astrology has a critical role in Culpeper's recommendations. For some sense of this: Woolley B. *The Herbalist Nicholas Culpeper and the Fight for Medical Freedom*. London: Harper Perennial, 2004, p. 175.
24. Meyrick (note 23) preface, pp. vi-vii, hints at a possible interest in astrology.
25. The point of 'reference books for those with knowledge' is made in Buenz EJ, Schnepple DJ, Bauer BA, et al. Bioprospecting Historical Herbal Texts by Hunting for New Leads in Old Tomes. *Trends Pharmacol Sci* 2004; 25: 494-498.
26. I might add that Meyrick did not mention it as treatment for wounds, while one dominant medical authority on materia medica at the time noted it was merely a 'weak astringent'. (Cullen W. *Lectures on the Materia Medica*. Dublin: Whitestone, 1781, p. 173.)

Christoph Glaser: A distinguished, controversial and mysterious Swiss Pharmacist in Paris under Louis XIV

Patrizia Catellani and Renzo Console

Introduction

Christoph Glaser[1] was one of the few distinguished pharmacists to make significant contribution to the development and teaching of chemistry in Europe in the 17th century. We are driven to write this article by the many inconsistent things that have been written about him, by the certainties claimed where uncertainty remains and by the intriguing, unsolved problem as to whether or not he conspired in murder. In particular we will suggest that there is credit given to Charas and Lémery that rightfully belongs to Glaser. We hope to provoke others to join us in the task of setting the record straight – or at least making clear what remains as uncertain.

He made chemical theory appear accessible[2] by avoiding all metaphysical considerations and explaining chemical operations in simple and understandable terms. He consolidated the systematic subdivision of such operations according to the nature of the substances involved, i.e. mineral, vegetable and animal. Later the more famous Nicolas Lémery was wrongly given credit for this. Glaser's contribution was overlooked for a long time and in some cases was misrepresented, as we are going to see later in this article.

We are trying to help future research about him by mentioning sources, reorganising what has been written so far, highlighting doubts and exposing clear mistakes. Interested readers might be able to distinguish between so much hearsay and the little reality that has appeared so far about our Swiss pharmaceutical chemist.[3]

Information on his life, education, residence, family, religion, the dates of his birth and death, and also the place and causes of his death, are all contradictory, inaccurate or non-existent. Although he was a German-speaking Swiss coming from Basel, he pursued nearly all his career in France and published the early editions of his only book, the *Traité de la Chymie*, in French. Glaser was protected and favoured by high ranking individuals. However it has been written that he was reserved and unsociable. He is not known to have been a member of academies or other organisations. There are no known portraits showing him with certainty.[4]

Glaser's name appeared in connection with a famous and controversial scandal when the Marquise de Brinvilliers underwent a trial for murder (*in absentia*) and Glaser was suspected of having provided her with poisons. It was at this very time that his career ended as suddenly as it had begun, leaving behind a large number of unresolved

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questions. Glaser's relationships with his famous colleagues, Moyse Charas and Nicolas Lémery, are unclear, although we know that they worked with him at some stage. The impression is that they did not particularly like him and vice-versa.

Like other researchers we still need to study the original sources in greater depth. Ideally we would like to find new documents in the hope of giving confident answers to the questions that are still open.

For example, questions like these: When was Glaser born and what was his origin? How and where did he learn chemistry? Why and when did he move to Paris, and where was his pharmacy located? Why was he favoured by the French royals and their entourage? Was Nicolas Lémery his apprentice for only a few months? What was Glaser's contribution to the development of chemistry? Was Moyse Charas right to claim the authorship of Glaser's *Traité*? How bad was Glaser's role in the de Brinvilliers poisons affair? Was he ever imprisoned, either briefly or for a long time? What is known about his wife (or wives)? Why did he vanish in 1672? Did he return to Switzerland to continue his work there? When and where did he really die?

Glaser's Origin and Early Career

One of the very few things that are sure about Glaser's life is that he grew up, studied and started his profession in Basel (see Fig. 1). We also know from Glaser himself that he travelled to Slovenia looking for minerals before he moved to Paris.

We do not know with certainty when Glaser was born. For many years since 1890 historians have followed a suggestion made by Henri Lagarde[5] that Glaser was born in about 1615. We tend to agree with him. However the historian Paul Dorveaux, without mentioning the source of his information, wrote in 1929 that Glaser had been born on 27th January 1628 in Basel.[6] Many historians have later accepted this date.

We know from editions of his only book that Glaser established and maintained his Parisian domicile and pharmacy in the Foubourg Saint-Germain. However in his books we have seen two different names for the place where he actually lived and a third one in the archives of the Bastille. Possible places are:

The *petit marché*, shown in the title-page of the 1663 edition of Glaser's *Traité de la Chymie*.

The *rue Neufve des Fossez*, in the title-page of the 1668 edition of the same *Traité*.

The *rue du Petit-Lion*, mentioned in a 1676 unofficial transcript of the Marquise de Brinvilliers's trial.

This may mean that Glaser moved his practice at some point, or that some of the addresses were different ways of indicating the same place. Some authors have written that he moved once; others have simply chosen to mention one of the three addresses. We have seen a modern thesis on Glaser[7] where the author has, in his view, been able to identify the present names of the streets and has concluded that Glaser only moved once, without leaving Saint-Germain.

Glaser's first major appointment in Paris was as demonstrator of pharmaceutical chemistry at the Jardin des Plantes, also located in Saint-Germain and so he would not have had to travel too far to deliver his lessons. See Fig. 2.

We can ask ourselves why Glaser decided to move to Paris. There is no easy answer to this question. It is possible that the King's physician Antoine Vallot had heard about Glaser's reputation and had called him to Paris. It has been suggested that the finance

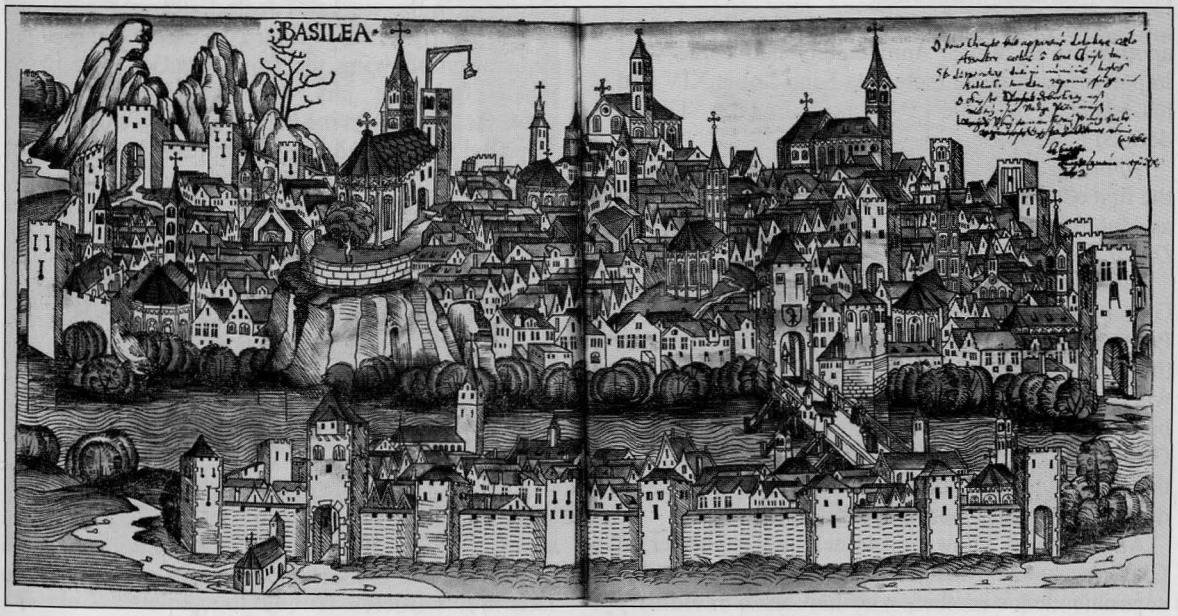

Figure 1. Map of Basel (1493), the town where Glaser grew up, studied and started his profession.

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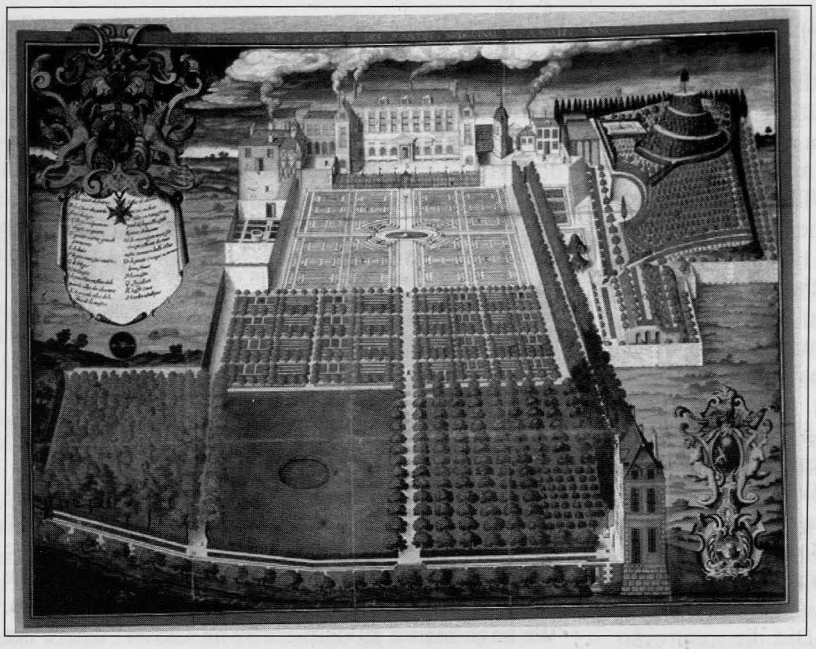

Figure 2. The Jardin des Plantes, Paris, where Glaser was demonstrator of pharmaceutical chemistry.
Wikimedia Commons, http://commons.wikimedia.org/.

superintendent, Fouquet, might also have influenced Glaser's decision. This is likely but cannot be proved.

The first documented work carried out by Glaser for the French was a series of trips to Florence in about 1657 on behalf of Fouquet to look for poisonous plants which were better known there than in France. This may have happened just before or soon after his permanent move to Paris, and someone has suggested that this was because Fouquet was planning to poison someone important in Paris, possibly cardinal Mazzarino.[8]

For whatever reasons Glaser moved to Paris; as an apothecary he almost immediately had some very important customers, including King Louis XIV and his brother the Duke of Orléans. In fact, Glaser defined himself as

'*Apothiquaire ordinaire du Roy*' in the title page of the first edition of his *Traité de la Chymie* (1663) and as '*Apoticaire ordinaire du Roy & de Monseigneur le Duc d'Orleans*' in the second edition (1668).

It is disappointing that no genuine portrait of Glaser seems to exist, despite the fame he acquired in Paris. There is one engraving taken from a painting that Franz van Mieris made for the Duke of Orléans when Glaser was the duke's apothecary. It has beensuggested that the painter might have seen Glaser at work and used the scene for his picture. But this chemist looks too old, considering that Glaser died at the age of 57 or even earlier.

Another well known customer and supporter of Glaser's was Madame Marie Fouquet, the superintendent's mother, who had an extraordinary interest in pharmacy and wrote a 'charitable' book teaching the poor how to compose remedies cheaply for themselves. Some elements of her book seem to indicate that she used Glaser's advice or used his *Traité* while compiling her book.

Glaser's Skill in Pharmaceutical Chemistry

Glaser must have already been known as an accomplished pharmaceutical chemist when he arrived in Paris, because his prestigious appointment as demonstrator at the Jardin Royal took place in 1660, just three years after arriving in Paris. He replaced the well known Nicolas Lefèvre, author of a *Course de Chymie*, who had decided to move to England. Glaser wrote his own *Traité de la Chymie* for the benefit of the students attending his courses at the Jardin Royal.Towards the end of the 19th century the French doctor and historian Gabriel Legué, wanting to highlight Glaser's skills, included a speculative description of how Glaser's pharmacy and laboratory might have looked in his book *Médecins et Empoisonneurs au XVII^e Siècle*.[9] Unfortunately the title and the subject seem quite inappropriate; but Glaser is treated with respect and his skills are properly acknowledged and described.

Legué did not mention where he had found inspiration for his description of Glaser's pharmacy; but some decades earlier Paul-Antoine Cap had described Charas's pharmacy in a very similar way, referring to the works of Jean de Renou[10] published in the early 17th century. Renou included an illustration showing the front room of a pharmacy where the best jars were on display and the pharmacist was serving his customers. Probably both Cap and Legué had this illustration in mind when they were writing their descriptions. A small door at the back of the room concealed two furnaces and the storeroom from the customers' view.

Glaser did not hesitate to convey his inclination for iatrochemistry, even using alchemical symbols and mottoes in the frontispiece of his book. He included a typical statement characteristic of iatrochemistry: what happens in nature also happens in the human body.[11] By this he meant chemical reactions; and that if they go wrong, they can be corrected with chemical remedies.

A second motto[12] means that 'without fire we cannot accomplish anything'. This reminds us of the importance that furnaces and the appropriate degree of heat have in Glaser's book, as we are going to see later in this article.

All of this appears to indicate that Glaser was a willing disciple of Paracelsus, an interesting and

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controversial figure of the 16th century. But despite his preference for this old author, Glaser is credited with the first precise description of the preparation of certain substances. The best known is *sel polychreste*, which means a salt that can be used for many therapeutic purposes. Glaser's salt is known today as potassium sulphate.

Glaser's *Traité de la Chymie*

Glaser's only book[13] focuses more on chemical operations with minerals than with plants and animals. Organic chemistry had not been developed yet, and many operations (e.g. distillation) involving what today we call organic substances would now be classified as physical rather than chemical. See Fig. 3.

At the beginning of the *Traité* Glaser explains the purpose of his book: first, to say only what he knows and to write only about what he has actually done; second, to provide a brief and easy method for accomplishing the most necessary chemical preparations.[14] The first part of the book contains a long list of all the known chemical procedures (42 of them) in alphabetical order. Their purpose was to separate and extract pure substances from natural compounds. Each operation is explained in detail

Figure 3. Title-page of the first edition of Glaser's *Traité de la Chymie*.
Universidad Complutense Madrid, http://www.ucm.es/BUCM/

and, according to Glaser, in terms comprehensible even for beginners.

Glaser included two illustrations in the first edition of the *Traité* and added a third one later. The first table shows different kinds of apparatus for distillation; the second shows various tools and small furnaces; the third shows large furnaces. As we have seen, fire and heat were very important to Glaser.

Different Opinions about Glaser

Over the centuries there have been many and diverse opinions expressed about Glaser. His colleague and successor[15] Moyse Charas, who had benefited from Glaser's chemistry lessons, tried to obscure Glaser's importance by claiming to have been the real author of Glaser's *Traité*, but made his claim only after the end of Glaser's career. We think Charas might have helped Glaser by taking notes during his lessons, but we do not believe Charas actually originated the concepts and techniques explained in Glaser's text.

Also the famous Nicolas Lémery had been a pupil of Glaser's and accused him, through the academician Bernard de Fontenelle, of being obscure and unwilling to share his knowledge with others. But again in this case, too, it happened only after Glaser had disappeared. However the present authors are able to demonstrate, perhaps surprisingly, that Lémery's first and celebrated work, the *Cours de Chymie*, was almost entirely paraphrased from Glaser's *Traité*.[16] Lémery himself, in the preface of his *Cours*, conceded that many of his preparations had already been published (but he did not say by whom) and he did not think it was necessary to modify them because he saw nothing wrong with them.[17] However it seems surprising that no historian, as far as we know, has remarked that almost everything had already been written by Glaser. The well known Fontenelle, who wrote Lémery's panegyric when the latter died,[18] used the

Figure 4. Hermann Conring in 1687 was the first author to publish biographical data about Glaser.
Courtesy of the Smithsonian Institution Libraries, Washington, DC.

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opportunity to criticise Glaser's alleged faults, clearly on the basis of what Lémery had told him.

In the 19th century the distinguished scientist and professor of chemistry Jean-Baptiste Dumas ridiculed Glaser's supposed intricacy, comparing him unfavourably with his predecessor[19] Nicolas Lefèvre and repeating Fontenelle's errors.[20] One might want to compare Glaser's exposition of chemical theory with the metaphysics of Lefèvre,[21] and judge independently which of the two is easier to understand.[22]

On the other hand Hermann Conring (Fig. 4) had published reliable information on Glaser as early as 1687, praising his skills. In the following centuries some historians were influenced by Fontenelle and Dumas; but luckily other authors (mainly outside France) expressed more balanced views about Glaser's value.

The Case of the Marquise de Brinvilliers

At this point we cannot fail to mention the events that coincided with Glaser's career's sudden end. In 1672 a gentleman named Godin de Sainte-Croix died unexpectedly. The police found chemical substances and documents in his house, including some correspondence from his lover, the Marquise de Brinvilliers. In one letter there was a reference to poisons and to the so-called Glaser's recipe. The Marquise's father and two brothers had all died recently and mysteriously within a short period of time. The Marquise immediately fled to Belgium and was convicted '*in absentia*' for their murder. Glaser disappeared forever at aproximately the same time. The case produced much speculation that has continued for centuries. Fictional drawings were used to illustrate some of the many versions of the story. One of them shows Sainte-Croix (wearing a glass mask to protect himself against poisonous fumes) and Glaser preparing poisons together in Glaser's workshop.

In 1676 the French authorities managed to arrest the Marquise in Belgium and brought her back to Paris. She strenuously denied any involvement in the death of her relatives but eventually confessed. She exonerated Glaser but accused Fouquet as having attempted to poison cardinal Mazzarino. Semi-fictional stories continued to be published about the case. One of the illustrations showed the distressed Marquise being comforted by her confessor Edme Pirot only a few hours before her execution.

For more than three centuries, many well known people have been interested in the Brinvilliers affair. For example, Madame de Sévigné, best known for her correspondence with her daughter Comtesse de Grignan, immediately knew everything about the events of 1676 and wrote to her daughter that she believed in Glaser's guilt and in Fouquet's innocence. She did not write why. It may sound odd that it was only selectively that she chose to believe in Brinvilliers's confession.

The famous writer and philosopher Voltaire was not very accurate in his research and thought wrongly that Glaser was German; but – unlike many other authors – rightly refrained from stating that Glaser had been personally involved in providing the poisons, or that he was imprisoned, because there was no certain evidence.

In the 19th century the well known French novelist Alexandre Dumas included the case of the Marquise de Brinvilliers in his *Crimes Célèbres*. He stated that Glaser had died earlier than Sainte-Croix while experimenting with poisons; but this cannot be found in any official document and looks very unlikely.

For those who wish to investigate what has been written about Glaser, we can recommend the catalogue of James Young's vast private library compiled by John Ferguson in Glasgow in 1906. It contains the complete details of some of the 18th century editions of Glaser's *Traité* owned by Young and also a brief and generally correct Glaser's biography (on the basis of what was known about him at the beginning of the 20th century). In addition Ferguson has included a vast additional bibliography of books that refer to Glaser, which is the best sample available to present researchers.[23]

Glaser's Disappearance

The biggest mystery about Glaser must be what happened to him in 1672. Did he die suddenly, as his publisher wrote very clearly in the title page of a new edition of the *Traité* published that year? The King, his police, and even Madame de Brinvilliers believed so. But others have decided to ignore the publisher and the authorities, and have written that Glaser was arrested but soon released, or that he remained there for a long time, or even died at the Bastille. However there is no reliable record of any of these hypotheses.

Or did Glaser return secretly to Basel, as stated by the local professor Häfliger who did some further research there about 70 years ago? We suspect this was a case of mistaken identity. Glaser has always been a very common surname in Basel.

We hope that more research on Glaser will be forthcoming. The best place to look for something new is still Basel, especially if Glaser really did return there in 1672, after vanishing from Paris.

Acknowledgement

The authors, who are not native English speakers, wish to thank Michael Taylor for revising the text.

Authors' Addresses:

Patrizia Catellani, *patcat@interview.it*; Renzo Console, *mail@renzoconsole.demon.co.uk*.

Note. There are further illustrations on the back cover

End Notes and References

1. He was usually called Christophle or Christophe in France and his surname was sometimes spelled Glazer.

2. The theoretical aspects of chemistry were those that tried to explain the 'elements' (usually called 'principles'), the attraction between acids and alkalis, etc.

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3. The present article only contains some parts of our research. Our full study has yet to be published (in Italian).

4. However we are going to discuss a painting that might show Glaser, although it is not certain.

5. Lagarde H. L'Apothicaire-Chimiste Christophe Glaser. *Mémoires de la Société d'Émulation du Doubs* 1890; 6 (5): 407-421.

6. Dorveaux P. Apothicaires Membres de l'Académie Royale des Sciences (II. Moyse Charas). *Bulletin de la Société d'Histoire de la Pharmacie* 1929; 17 (65): 329-340; 17 (66): 377-390.

7. Vandecandelaere É. *L'Apothicaire Cristophle Glaser et Ses Rapports avec Madame de Brinvilliers*. Rouen: Faculté de Médecine et de Pharmacie de Rouen, 1982.

8. We are going to mention this later in more detail.

9. Legué G. *Médecins et Empoisonneurs au XVIIe Siècle*. Paris: Bibliothèque-Charpentier, 1895: 54-66.

10. His qualifications are shown as 'Medicus Parisiensis et Regius' in one of his portraits.

11. 'Superius et inferius idem' ('The upper and lower [kingdoms are] the same').

12. 'Sine igne nihil operamur.'

13. For the purpose of the present study we have mainly used three French editions of Glaser's *Traité de la Chymie*: Paris, chez l'Autheur, 1663; Paris, Jean d'Houry, 1668; Paris, Jean Dhoury, 1672. We have also seen two early translations: *The Compleat Chymist, or, a New Treatise of Chymistry.* London, John Starkey, 1677; *Novum laboratorium medicum-Chimicum, Das Ist: Neu-Eröffnete Artzney- und Werck-Schul.* Nuremberg, Michael und Johann Friedrich Endtern, 1677.

14. Glaser's precise words were: 'Pour moy, qui fais no profession de ne dire rien que ce que ie sçai, & de n'écrire rien que ce que j'ay fait, ie me suis seulement proposé dans ce petit Traité, de donner au public une methode briéve & aisée, pour venir heureusement à bout de tutes les plus necessaires preparations de la Chymie.' Glaser C. *Traité de la Chymie.* Paris: Jean d'Houry, 1668: Ed. 2, Preface (not paginated). Later Lémery wrote almost exactly the same at the beginning of his Cours de Chymie. Lémery N. *Cours de Chymie.* Paris, chez l'Autheur: 1675: Preface (not paginated).

15. As demonstrator of pharmaceutical chemistry at the Jardin des Plantes.

16. Lémery's text has the same subject as Glaser's and also the same structure. The titles, sections and prefaces of the two works convey the same purpose. The structure of the two books is the same: a short theoretical part is followed by three large sections in the same sequence: minerals, vegetables, animals. The definition of chemistry is the same. Lémery repeats Glaser about the five principles of natural things: spirit, oil, salt, water and earth. Lémery's list of chemical operations is a subset of Glaser's, but the wording of each operation is substantially the same as in his former teacher's book. Glaser describes 22 minerals and Lémery 21, and 20 of them coincide. The titles are the same and the descriptions are very similar. Our conclusion is that the students of pharmaceutical chemistry attending Lémery's lessons in 1675 could have used Glaser's text instead of Lémery's without many problems, because they would have found there 80% of what the teacher was saying (and 95% of his mineral preparations).

17. Lémery's precise words are: 'Ie n'affecte point d'étre particulier dans mes Operations: On ne verra plusieurs qui ont déja esté descrites de la mesme façon, n'y ayant rien trouvé à reformer.' Ref. 13.

18. Fontenelle B.L.B.d. *Éloges des Académiciens, avec l'Histoire de l'Académie Royale des Sciences en M.DC.XCIX.* The Hague: Isaac van der Kloot, 1740: Vol. 1, 334-350.

19. In the role of demonstrator of pharmaceutical chemistry at the Jardin des Plantes.

20. Dumas J.-B. *Leçons sur la Philosophie Chimique.* Paris: Gauthier-Villars, 1878: Ed. 2, 69-70.

21. Lefèvre N. *Cours de Chymie.* Paris: Jean-Noël Leloup, 1751: Ed. 5, Vol. 1, 17-25.

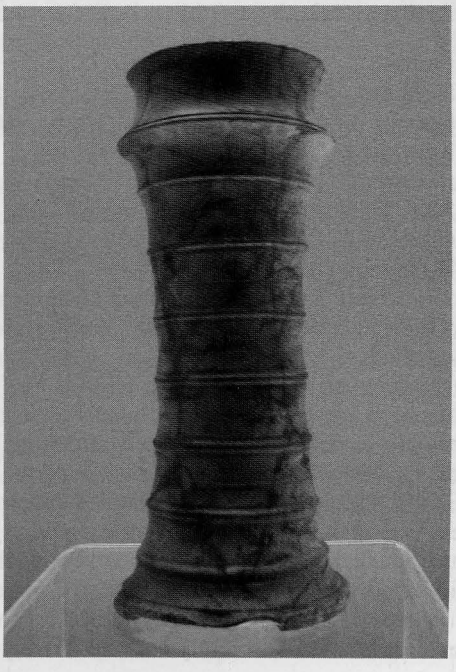
22. At the time of writing this article both texts are available on-line in the French National Library website (http://gallica.bnf.fr/).

23. Ferguson J. *Bibliotheca Chemica: a catalogue of the alchemical, chemical and pharmaceutical books in the collection of the late James Young of Kelly and Durris.* Glasgow: John Maclehose and Sons, 1906: Vol. 1, 319-321.

Letter to Editor

A Songze Jar

During a recent trip to China I was reminded of the suggested ancestry of the classic concave-shaped albarello pharmacy jar. The sight of the casual use of simple sections of bamboo stem for containers verified their practicability and distinctive shape. However a subsequent visit to a remarkable museum excited my interest further. The Shanghai Museum contains a staggering collection of Chinese cultural



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relics that emphasises the continuity of an ancient culture in bronze work, painting, calligraphy and ceramics. Among the artefacts was a familiar shaped jar, labelled as a 'Grey Pottery Bamboo-Shaped Vase; Songze Culture'.

The historic influence of the 'west' through the Silk Road is clear in China. This was most obvious during my visit to the city of Xi'an that was the ancient capital and eastern destination of the trade route. Not only was it the point of entry for Buddhist texts into the country but also for the pomegranate tree that was introduced from the Middle East and is a feature of the region. Along the long trade route from China, exports such as raw drugs arrived in Afghanistan, Persia and the rest of the Arab world stored in practical bamboo containers. It is not very likely that precious and fragile pottery containers, such as the Songze jar, would itself have been an item of transcontinental trade. However, its existence shows the step from 'plant technology' to mimicking manmade artefact had already been taken in China. The same step is said to have occurred in the Arab world to create jars which were in turn to inspire the Italian pharmacy jars from the 16th century onwards, the most extravagant of which are the familiar majolica ware. In addition to supporting the theory of the bamboo origins of the albarello form, the Songze jar also prompts another theory, that the Silk Road might have carried the idea of making durable and desirable manmade copies in clay. But in what era of Chinese history was the finely-worked jar made? I recommend the Shanghai Museum if you wish to get some perspective of China's historical time scale: the exhibit's label explained that Songze culture flourished in the plains of the lower Yangtse river between 3800–3200 BC.

Gareth Evans Member May 2008

Review

Chymists and Chymistry. Studies in the History of Alchemy and Early Modern Chemistry.

Lawrence M. Principe (ed.). Sagamore Beach, MA, USA: Watsons Publishing International, 2007. Hardback, 274 pp. ISBN 978-088135-396-9. Price $45.00.

So much has been published about alchemy and it is always important to distinguish which background motivated the authors to deal with this often misunderstood subject. In the case of the present volume, however, the reader can be convinced of the absolute expertise of editor and authors: they are among the most distinguished experts in the (English-speaking) world. The book summarised the results of an international conference held in 2006 at the Chemical Heritage Foundation in Philadelphia. In his introduction, the volume's editor, Lawrence M. Principe, highlights the importance of alchemy research which has recently become a lively subject in science. The 2006 conference with more than a hundred participants established a benchmark for state-of-the-art research. In total, 34 papers were presented there and 22 found their way into this remarkable volume. The chapters cover the time-frame from early Paracelsism to the late eighteenth century and thus the period when alchemy and chemistry (or, as the title says, chymistry) were fighting each other strongly in theoretical and practical terms. Paracelsus himself, important successors or competitors and their works are stressed in several chapters. So information is given about Andreas Libavius (Bruce T. Moran), Paracelsism in France (Didier Kahn), Alexander von Suchten, Toxites, Adam von Bodenstein (Dane T. Daniel), Athanasius Kircher (Hiro Hirai), Giovanni da Correggio (Wouter J. Hanegraaf), Jean Perréal (Barbara Obrist), or Herman Boerhaave (John C. Powers). Other chapters focus more on the competition of theories or exegetic problems of alchemical literature, i.e. the interpretation of the Emerald Tablet (Peter Forshaw) or the originally Arabic *Liber de aluminibus et salibus* (Gebriele Ferrario), the search for 'certainty' in chemical sciences (Stephan Clucas), the struggle with catholic objections against alchemy (Margaret D. Garber) or Newton's theory of metallic generation (William R. Newman), 'gender malleability' and 'sexual fluidity' (Allison B. Kavey), mechanism and alchemy (Bernard Joly), vitalism versus the materialistic world (Ku-Ming Chang), interpretation of Boyle by Samuel Cottereau Duclos (Victor D. Boantza), the relationship between Cartesians and chemistry (Luc Peterschmitt), occult tradition and enlightened science in Sweden (Hjalmar Fors) and Germany (Claus Priesner). It is correctly stated that 'the bulk of the history of alchemy and chemistry relies on treatises, correspondence and other writings [... which may] have led to a bias towards theoretical speculations that tend to downplay the practical side of these disciplines' (p. 149). Therefore, it is right that three chapters summarise recent results of archaeological findings giving insight into the practical side of alchemical procedures. Marcos Martinón-Torres and Werner R. Soukup discuss scientific information about early modern laboratories relying on excavations around the world, mainly Switzerland, Austria, France and Germany. That alchemical 'fraud might have some utility in practical, even entrepreneurial, terms' is shown by Tara Nummedal.

It is certainly a sign of outstanding expertise that the authors here, in contrast to many other English language publications, refer to foreign, mostly German language sources whenever appropriate. They are, throughout, quoted correctly, which is very unusual in English language literature. This demonstrates the care taken by authors and editors and suits well the high class content of every single

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chapter. A comprehensive index and several well chosen illustrations complete the volume.

This is undoubtedly: a 'must have' for everybody seriously involved in alchemy research.

Dr Axel Helmstaedter

Review

History of Pharmacy in India and Related Aspects. Volume 5: Builders and Awareness Creators of Modern Pharmacy 2

Harkishan Singh. Delhi, India: Vallabh Prakashan, 2008, pp.362 (hardback price £36.00).

This is Harkishan Singh's fifth book in his series exploring the history of pharmacy in India. And there is still more to come; in his preface he tells us that 'the work on more of the contributors to the organisation and development of pharmacy is in progress'.

The book consists of a collection of twelve biographies, of varying lengths and presented alphabetically, together with a brief introduction. Pages 253 to 357 append the presidential addresses of seven of the subjects, and these provide a useful record of the progress made by pharmacy in India in the immediate post-independence period.

It was in his fourth volume (since re-titled 'Builders and Awareness Creators of Modern Pharmacy 1'), which described the life and professional career of Mahadeva lal Schroff, that Singh quotes the New Zealand pharmacist Douglas Warr, who noted that 'while pharmacy has made few men great, a few great men have made pharmacy'. Warr was referring to individuals such as Jacob Bell and Daniel Hanbury, and Singh suggests that Schroff deserves a place alongside that group. However, in this book he is careful to avoid burdening his subjects with the mantle of greatness, suggesting only that they made valuable contributions.

Singh demonstrates that, when the organisation of the pharmacy profession in India began in 1935, it was the department of pharmaceutics at the Banaras Hindu University, headed by Schroff, that emerged as 'the citadel of pharmaceutical leadership'. Singh is himself a former professor of medicinal chemistry at that University. Four of Schroff's colleagues are profiled in the book: NK Basu, DN Majumdar, S Prasad and GP Srivastava. All the subjects were born between 1870 and 1916, and the focus is therefore on developments during the twentieth century, particularly the twenty years before and after independence in 1947.

From 1941 onwards a group of pharmacists in Bombay (KC Chatterjee, ML Khorana, HR Nanji and BV Patel) also gained prominence, and RP Patel from Ahmedabad was closely associated with them; biographies of all five appear in the book. Finally the careers of three early pioneers, JC Ghosh, BN Vyas and SN Biswas, are also briefly described.

The subjects of his profiles were pioneers in a number of different areas; for example, Singh credits JC Ghosh with being the instigator of the struggle for statutory control over drugs and pharmacy practice in India during the 1920s; GP Srivastava was the first to promote the idea of ethics in the practice of pharmacy in India; and BV Patel established the first new School of Pharmacy in India following independence.

As in previous volumes the emphasis is on description rather than reflection. Singh describes in detail the papers they wrote, the appointments they held and the committees they sat on. There are occasional glimpses of the personalities behind the achievements, but little to tell us what motivated them to do what they did.

Close ties to Britain are apparent. Five of the subjects undertook their training in England. JC Ghosh was sent by the Government of India to qualify as a pharmaceutical chemist at Manchester in 1910. Some years later KC Chatterjee sailed to England and also studied at Manchester University, obtaining his degree in 1940. BV Patel was awarded his degree by Chelsea Polytechnic in August 1940 after three years study. HR Nanji obtained his PhD in organic chemistry from Imperial College London in 1932; and RP Patel was awarded a PhD in pharmacological chemistry by University College London in 1936.

But there are also hints of underlying tensions in the relationship with Britain. During his school days GK Srivastava 'took part in 1930-31 movement and received punishment for the participation'; he 'was a true nationalist' and 'an ardent advocate for use of Hindi'. Of DN Majumdar, Singh writes 'he not only had a very brilliant student career but was also full of patriotism. The latter zeal induced him to join some terrorist groups in the old Bengal of the undivided India, and thus he contributed his share to the fight for the Indian freedom.' Yet issues such as how pharmacists managed their relationships with the Government of India on the one hand and nationalist leaders on the other are not explored.

Singh's own contribution has been to raise the profile of the history of pharmacy in India, to restore key individuals to their rightful place in pharmacy's history, and to retrieve a great deal of valuable material from the archives.

This book, like the previous ones in the series, has been rigorously researched and is meticulously referenced. The next step is to present this material in a broader social, political, cultural and economic context, and to locate it in the wider literature on the history of pharmacy and medicine; Singh has created an important legacy on which future social historians of pharmacy can build.

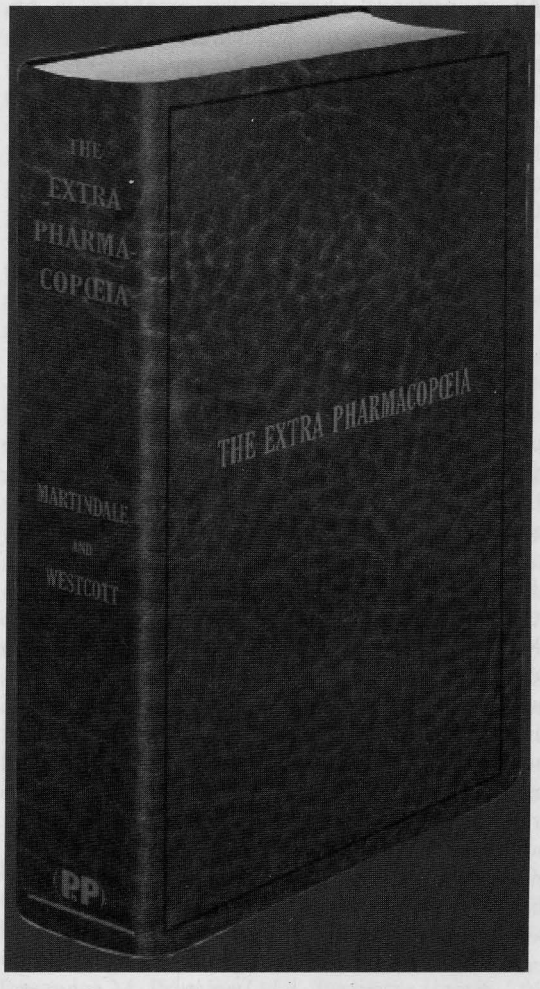
Dr Stuart Anderson

https://doi.org/10.24355/dbbs.084-201803131618

Review

The Extra Pharmacopoeia of unofficial drugs and chemical and pharmaceutical preparations.

William Martindale and W Wynn Westcott. 1st Edn, London: HK Lewis, 1883. Reprint 2008, London: Pharmaceutical Press, 2008, 313 pp. ISBN 978-0-85369-826-5. Price £19.95.



If you suggest that knowledge about pharmaceuticals increased by 25 times in the last 125 years, you are perfectly right: this is exactly the difference in volume between Martindale's first edition, dated 1883, and the current one published in 2007. This is, by the way, far more of a difference than that between the brains of monkeys and men. What started as an 'Extra Pharmacopoeia' is now called 'The complete drug reference', roughly what it had always been, although the first editions were compiled to describe new drugs not yet listed in an official pharmacopoeia. As a sign of fruitful cooperation between a distinguished pharmacist and a physician, pharmaceutical knowledge, as usually found in pharmacopoeial literature like solubility, appearance or composition, is combined with therapeutic experience, initially compiled by Wynn Westcott. Certainly being ahead of their time, Martindale and Westcott gave literature quotations for all the facts mentioned, which makes the book so extremely valuable for the pharmaceutical historian. Thus, *Martindale's* early editions are an ideal starting point for research about the development of drug therapy, as one can easily move forward to the original reports if interested in detail. Therapeutic information in the first edition came from the most relevant medical and pharmaceutical periodicals including the *BMJ,* the *Lancet* or the *Pharmaceutical Journal,* and from contemporary pharmacopeieas. Most remarkably, formulas from some hospital pharmacopoeias were also included whose originally limited audience was expanded by being mentioned in *Martindale* and making hospital experience available to the general public.

Old *Martindale* editions are rare and it is therefore highly acceptable that the Pharmaceutical Press has produced a reprint edition in the year of the book's 125th anniversary. Not only professional historians but every pharmacist will gain a great deal of – in part totally unexpected – knowledge by simply browsing the pages. This refers to common 19th century preparations as well as to astonishing facts about therapy; so who knows that the cytotoxic drug podophyllin has been recommended almost exclusively as a 'powerful biliary purgative'? Almost unbelievable, six oral preparations are listed and – according to the *BMJ* – are praised as 'one of the most satisfactory and reliable of our medicines.' *Martindale's* 2007 edition still refers to the gastrointestinal effects but of course strongly discourages oral (and even topical) administration of the substance, 'which is highly irritant to the intestinal mucosa and produces violent peristalsis resulting in a drastic purging action.' While today side-effects are a primary concern of the *Martindale* editors the original compilers were more enthusiastic about therapeutic efficacy. Another good example is the suggestion of Cannabis as a 'useful hypnotic'. So, one will learn a lot about therapy at the end of the 19th century – in detail but also in general considering for example the contemporary attitude towards drug therapy.

Thus to reprint *Martindale's* first edition was a brilliant idea, with only one minor criticism to be made: the reviewer's copy was unsufficiently bound with some sheets soon being detached. The reprint certainly agrees with the look and feel of an ancient book and might not only be regarded as a technical weakness but as a sign of the high interest of the reviewer who enthusiastically turned the pages.

Dr Axel Helmstaedter

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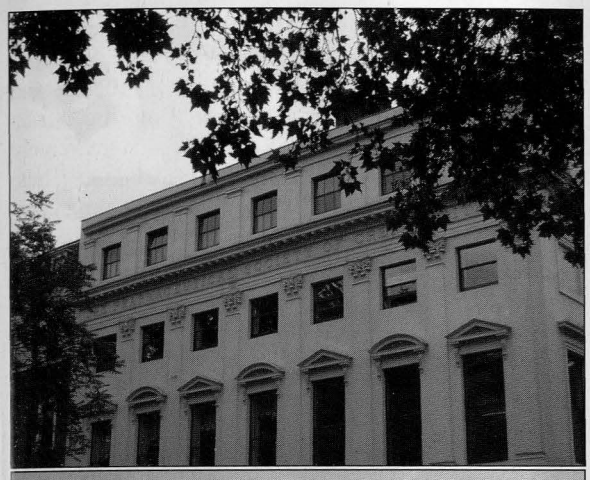
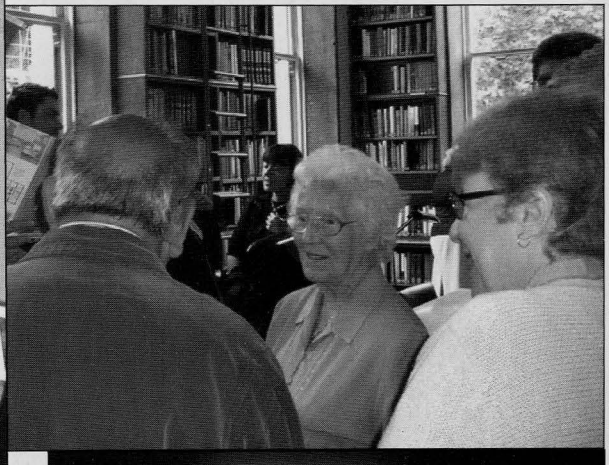
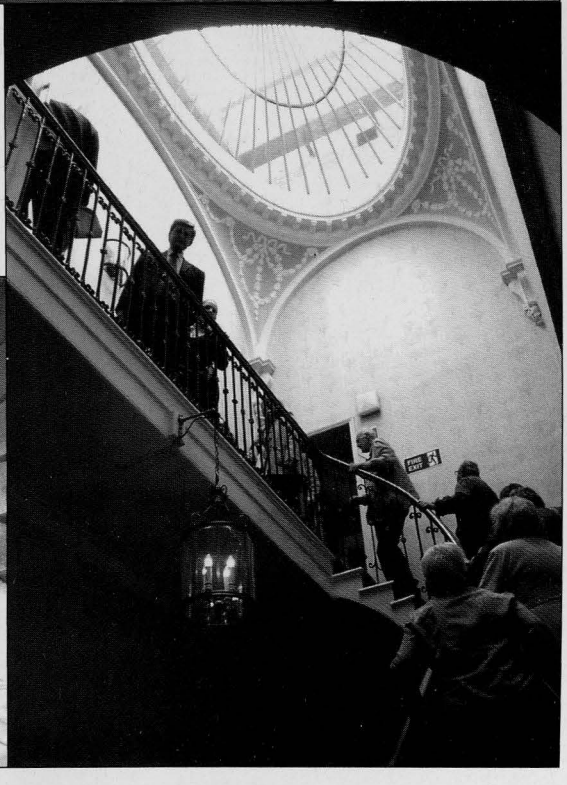


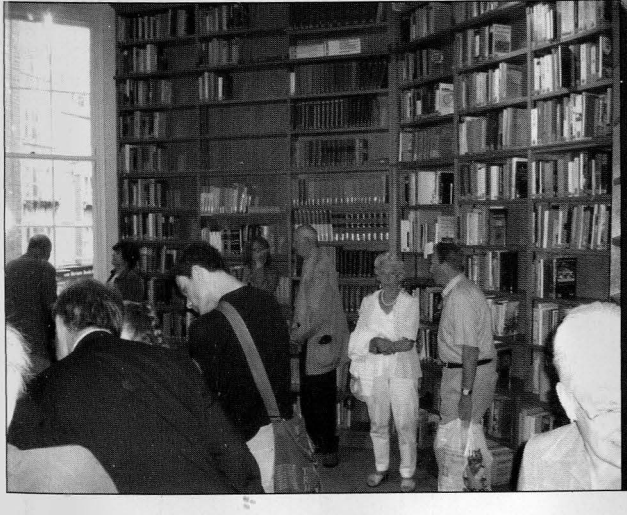
BSHP members visit 17 Bloomsbury Square, WC1, on 18 June 2008.

The'Square' was the home of the Pharmaceutical Society of Great Britain 1841-1976 and the London School of Pharmacy 1842-1960. It is now occupied by the German Historical Institute, London (http://www.ghil.ac.uk)

Below and clockwise: In the former Library, Mr Rajnikant and Mrs Marion Garner-Patel with Doris Jones, a former assistant to Agnes Lothian Short and Robert Todd; climbing the cantilevered stairs to the second floor; members in the Library; Roy Allcorn (head of information services, RPSGB), Heather Maddin and Doris Jones; 17 Bloomsbury Square from Great Russell Street corner.







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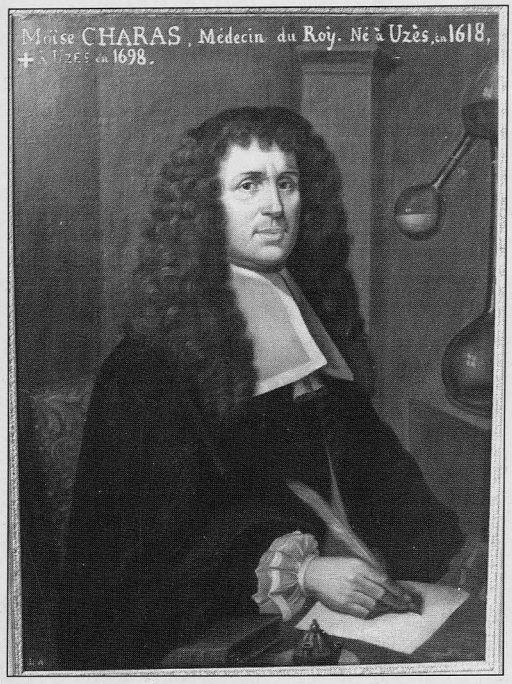


Catellani and Console: **Christoph Glaser** (from pp. 40-45) further illustrations.

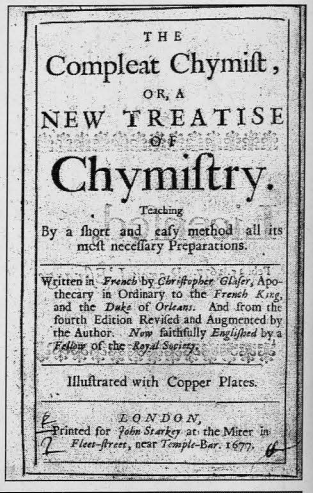
Left, above: Moyse Charas, who was Glaser's rival and claimed to be the author of his *Traité de la Chymie*. Courtesy of the Musée Georges Borias, Uzès.

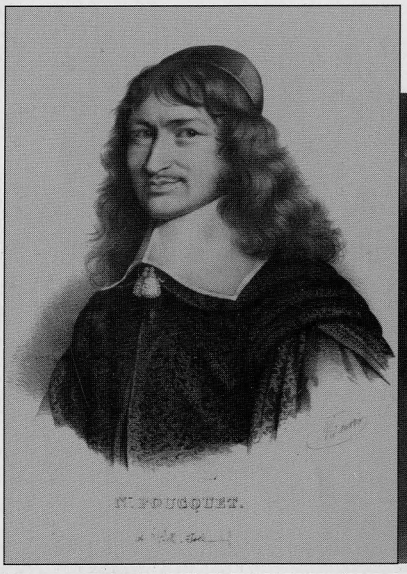
Left, below: The finance superintendent Nicolas Fouquet, who favoured Glaser. Wikimedia Commons, http://commons.wikimedia.org/.

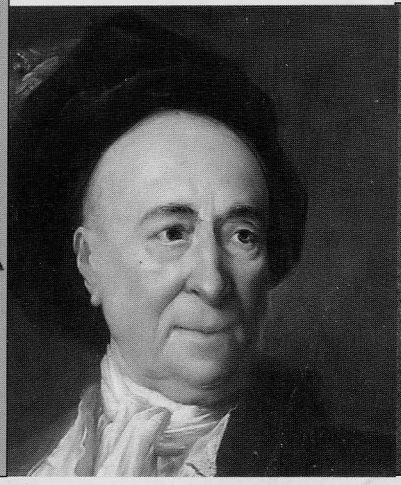
Centre: Bernard Le Bovier de Fontenelle, who criticised Glaser in a biased way in his *Éloge* of Nicolas Lémery. Wikimedia Commons, http://commons.wikimedia.org/.

Right, above: Title-page of *The Compleat Chymist* (1677), the only English edition of Glaser's *Traité de la Chymie*. Wellcome Library, London.

Right, below: Madame de Sévigné believed that Glaser had provided the Marquise de Brinvilliers with the poisons used to murder several members of her family. Fine Arts Museums of San Francisco, Achenbach Foundation for Graphic Arts, 1963.30.22992.


THE
Compleat Chymist,
OR, A
NEW TREATISE
OF
Chymistry.
Teaching
By a short and easy method all its most necessary Preparations.
Written in *French* by *Christopher Glaser*, Apothecary in Ordinary to the *French King*, and the *Duke* of *Orleans*. And from the fourth Edition Revised and Augmented by the Author. *Now* faithfully *Englished* by a *Fellow* of the *Royal Society*.
Illustrated with Copper Plates.
LONDON,
Printed for *John Starkey* at the Miter in *Fleet-street*, near *Temple-Bar*. 1677.





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Clarke Inquiry

Response from the Committee of the British Society for the History of Pharmacy (BSHP) on behalf of the Society January 2008

The BSHP was formed under the aegis of the Pharmaceutical Society of GB in 1967, having originated from its History of Pharmacy Committee, and is a registered charity.

Aims

To clearly indicate the basis of our comments, the aims of the BSHP are as follows:

- To act as a focus for the development of all areas of the history of pharmacy, from the work of the ancient apothecary to today's ever changing role of the community, hospital, wholesale, industrial or veterinary pharmacist.
- To promote historical studies related to pharmacy
  To advance knowledge and the propagation of understanding of the history of pharmacy
- To publish the research work of pharmaceutical historians
- To preserve pharmaceutical artefacts and historic pharmacies
- To support the work of relevant museums and offer advice on establishment of other pharmaceutical exhibits
- To co-operate with related professions and local historians on medico-pharmaceutical topics of mutual interest.

The current membership includes both pharmacists and non pharmacists.

Relationship with RPSGB

The BSHP would wish to be affiliated to the emergent body from the Royal Pharmaceutical Society of Great Britain's (RPSGB) impending break up of function, in much the same way as at present, but would not wish at this stage to consider a merger and the potential merging of its own funds. The constitution of the emergent body would need to allow organisations such as the BSHP to retain their charitable status, their financial independence and a separate membership list.

The BSHP is deeply concerned by the possible consequences of the politically driven Foster report, following which there appears to be little response from the Department of Health with regard to the serious financial implications which will arise. This could cause considerable uncertainty as to the future of the RPSGB's unique museum and its collection.

Publications

There is also concern about the future of the leading international *Pharmaceutical Journal*, established in 1841 and published weekly since 1870, which plays an irreplaceable role in ensuring communication to and between the wide and diverse pharmaceutical profession registered in the United Kingdom and also with many based overseas. It has always been crucial to the educational and updating needs of pharmacists, many of whom have to practice in relative isolation.

Publication has been a major strength and vital role of the RPSGB, but as well as being over the years of considerable importance from a financial perspective, it has been of the greatest importance as a producer of internationally accepted and leading sources of information such as *Martindale, the Extra Pharmacopoeia*, and a range of books in various areas of specialisation, including the history of pharmacy. Pharmacy and indeed the nation, cannot afford to lose this service.

Education

The BSHP has and is working hard to promote the important and relevant aspects of the evolution of pharmacy as a modest core component of pharmacy undergraduate education. Every profession has a parallel need to address such issues, as it enables and helps the constructive understanding of its members when it comes to exercising their responsibilities and the protection and care of the public. It is worth reinforcing the point that a major driver in the founding of the Pharmaceutical Society in 1841 was the need to urgently address education. Dr Jensen of the Royal Danish School of Pharmacy has said that 'history is a science that handles sequences and events'.

The highly responsible and demanding role of the RPSGB as regulator, introduced by government legislation in 1933, and the effect of several case law decisions have had a profound influence on the RPSGB and some may see it as having possibly to some degree detracted from its professional support of its members. Be that as it may, for the emergent body to be a success, it will be essential to continue and further develop the educational role. Of particular importance is the accreditation of

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all four year degree course programmes for the MPharm, and the organisation and running of the pre-registration year's practical experience programme and examination required prior to registration. For the emergent body to retain pharmacist membership, it will be no less important to apply further emphasis on programmes for continuing professional development (CPD), which should give more attention to considering the introduction of post-graduate courses leading to diplomas in relevant areas of practice, which could include the history of pharmacy. Precedents have already been established with the RPSGB's Diploma in Veterinary Pharmacy (established in 1981) and the Certificate in Public Health & Companion Animal Health Care, and there have been earlier examples. It is worthy of note that the Society of Apothecaries of London is an example of a long established professional body, which has successfully developed a wide range of diploma programmes of particular relevance to health care. The RPSGB framework for CPD is an essential framework for professional competence applicable to both pharmacists and to pharmacy technicians.

The Carter Report

The Carter report suggestion of a Royal college to replace the RPSGB would seem to be markedly flawed. The existing medical Royal colleges, which are presumably intended to be examples, now have limited functions and are exclusive rather than inclusive when compared with RPSGB. For a realistic way forward in the time span available, there is little alternative to building on the residue of the RPSGB and if possible retention of the existing charter, much of which is based on the original charter of 1843, subject to any necessary amendment. A new college would be unlikely to be granted a royal charter for some years, which would detract from the recognition and standing of pharmacy nationally.

The Inquiry

There are a number of questions asked by the Clarke inquiry which are of particular significance to BSHP and include:

- Should a professional body act as the guardian of the archives and museum of the RPSGB? BSHP believes that they are an important part of our heritage and must be adequately supported by the emergent new body. BSHP recognises and supports the important summary document (copy attached [p. 52]) on the museum collections' status, which includes reference to governance safeguards and issues of trust and integrity. It is understood that the document will be integrated with the submission from the RPSGB Council.
- What should the incentives for membership be? The main elements have already been referred to, namely the various aspects of education and CPD, the free weekly journal, library, museum resources and information service, local branch structure and support, and membership interaction through meeting programmes especially for specialised areas of expertise. There need to be worthwhile reasons for pharmacists in industrial, academic, regulatory affairs and veterinary pharmacy to continue their membership. The BSHP welcomes the proposal in the Carter report that the current Academy of Pharmaceutical Sciences and the Joint Pharmaceutical Analysis Group should be associated with the new body in much the same way as they have been with the RPSGB. The details will require careful attention as many members of both the Academy and the Group are non-pharmacists.
- Question 2: are there any functions which should not be part of the role of a professional body? Pharmacy does not have a trade union, unlike the medical BMA, dental BDA or the veterinary BVA, but it would not be appropriate for the emergent body to take on such a role. The present and earlier charters of the RPSGB prevented any such role, reinforced by case law, notably the Jenkin v PSGB case in 1920.
- Question 3: are there any additional functions that the body should perform? In order to achieve a responsible balance between the support of pharmacist members and the public interest, demonstrable strategic leadership is necessary, notably nationally, at EU and in relation to the Commonwealth. This includes matters relating to government, the media and to interaction and co-operation with other health professions. There is a need to continue to support appropriate research and to publish in the wide range of areas ably developed over the years by the Pharmaceutical Press.

Dr Michael H Jepson
President.
Mr Peter G Homan
Hon Secretary.
840 Melton Road
Thurmaston
LEICESTER LE4 8BN

https://doi.org/10.24355/dbbs.084-201803131618

24 January 2008

Dear Mr Clarke

Please find attached the response to your Inquiry, from the Committee of the British Society for the History of Pharmacy. We are appreciative of the opportunity which this has given to us.
If there are any issues which you and your Committee may feel require further clarification, we will be pleased to respond.
Yours sincerely

Dr Michael H Jepson President
Mr Peter G Homan Hon Secretary
840 Melton Road, Thurmaston, LEICESTER LE4 8BN

Briefing note: Royal Pharmaceutical Society of G B, Museum collections' status

The Museum's collections number around 45,000 objects, primarily donations from members received since the 1930s. These provide the foundation upon which all of the Museum's activities rest.

To abide by the Museums Association Code of Ethics (to which both the museum staff and the Council as its Governing Body are bound by the terms of Registration/Accreditation, and the Museum's constitution) the Museum cannot undertake financially-motivated disposal of its collections. If any disposal was undertaken, the money would have to be ring-fenced for re-investment in the Museum. Violation of the Code would result in expulsion from the Registration/Accreditation scheme which would therefore prevent the Society's Museum from access to funding sources and sectoral training, not to mention ostracising it from the rest of the museum community.

The Museum's constitution, agreed by Council, is based on this premise and contains the following clause:
5. The Museum's collections will be the property of the Society, but deemed to be held in trust for the benefit of current and future members and the wider public. The Museum's collections will not be treated as disposable assets, nor used to generate income for non museum purposes, nor used as collateral for loans.

In addition, under the Society's Supplemental Charter, 2004 (section 13), if the Society is wound up or dissolved
'*any property or funds whatsoever, the same shall not be distributed amongst the members of the Society or any of them but shall, subject to any special trusts affecting the same, be given or transferred to some other body or bodies with objects similar to those of the Society and the distribution of whose income and property is restricted to the same or greater extent as that of the Society*'.
Beyond these governance safeguards in place against disposal, the Museum's collections represent trust placed in the Society to safeguard its members' donations over the last 80 years and more. Getting rid of the collections breaks this trust - and also with the many non-members who have chosen to give their objects to this Museum to preserve them for future generations.

September 2007

Briony Hudson
Keeper of the Museum Collections, Royal Pharmaceutical Society of GB

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British Society for the History of Pharmacy
840 Melton Road
Thurmaston
Leicester LE4 8BN
bshp@associactionenterprises.com

31 July 2008

Mr Nigel Clarke
Chairman
The Transitional Committee
53 Chandos Place
Covent Garden
LONDON WC2N 4HS

Dear Mr Clarke

The British Society for the History of Pharmacy (BSHP) wishes to ensure that TransCom and whichever of the Working Groups is/are considered most appropriate, will be fully aware of the BSHP's keen interest to be involved in any discussions which reflect their aims. The aims are summarised as follows:

- Promotion of historical studies related to pharmacy,
- Advancement of knowledge and propagation of understanding of the history of pharmacy,
- Publication of the research work of pharmaceutical historians,
- Preservations of pharmaceutical artefacts and historic pharmacies,
- Support for the work of relevant museums and offering advice on establishment of other pharmaceutical exhibits and on the preservation of pharmacies,
- Co-operation with related professions and local historians on medico-pharmaceutical topics of mutual interest.

BSHP represents an integral part of the pharmacy profession and can continue to play an important part in education at both undergraduate and postgraduate levels and in research relevant to the 'new body'. The RPSGB Museum and archives are seen to be of great importance to our heritage and deserving of our collective unequivocal support. BSHP has been working with the museum staff to produce an extending series of educational leaflets addressing the evolution of pharmacy, notably for MPharm students and lecturers.

Educational opportunities, additional to CPD, could be of considerable attractiveness to the retention and addition of members to the new body, especially if they facilitate pursuance of, for example courses leading to new certificates or diplomas in areas of specialisation and could generate financial support.

As you know, BSHP submitted a concise 3 page response to the Clarke Inquiry, which TransCom members may wish to re-examine, as it elaborated on several issues of on-going relevance, including our overseas and non pharmacist membership.

The BSHP Committee thank you in anticipation for considering our request and look forward to your response and in particular your advice as to which of the Working Groups we should be associated.

Yours sincerely

Dr Michael H Jepson President, and Mr Peter G Homan Hon Secretary,

on behalf of the BSHP Committee.

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British Society for the History of Pharmacy
840 Melton Road
Thurmaston
Leicester LE4 8BN
bshp@associactionenterprises.com
26th September 2008

Mr Nigel Clarke
Chairman
The Transitional Committee
53 Chandos Place
Covent Garden
LONDON WC2N 4HS

Dear Mr Clarke

The Committee of the British Society for the History of Pharmacy (BSHP) thank you for the prompt acknowledgement of the two communications (ref 1 and 2) sent to you earlier this year, which we appreciated. We are much encouraged by the developments which have been taking place over recent months with regard to the new body, and thank you for your commitment and leadership in addressing such a challenging task.

We are interested to hear that consideration is now being given by TransCom for affiliate status to the new professional body, which could be available to certain organisations with strong associations with pharmacy, but whose members may not all be eligible for full membership of that new body.

Affiliation could well be the best arrangement for BSHP to be closely associated with the new body in order to continue its historic association as it has had with the RPSGB. Whereas the majority of the members of the BSHP and of its committee are pharmacists eligible for full membership of the new body, the committee is concerned about our non-pharmacist members, our overseas members and of our charity status.

We would greatly appreciate the opportunity when possible, to share our unequivocal interest in the new body and issues such as affiliation, with for example a relevant Working Group, as and when you would feel it would be most meaningful.

With all best wishes and we look forward to your response.

Yours sincerely

Dr Michael H Jepson President, and Mr Peter G Homan Hon Secretary,
on behalf of the BSHP Committee.

Ref 1: 25.01.2008 – Response from the Committee of the BSHP to the Clarke Inquiry. Includes, Aims, Relationship with RPSGB, Publications, Education & research, and particular reference to the museum and archives.
Ref 2: 31.07.2008 – Summary of aims etc for reference to TransCom

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Review

Burroughs Wellcome & Co: Knowledge, Trust, Profit and the Transformation of the British Pharmaceutical Industry, 1880–1940. Roy Church and E. M. Tansy. Lancaster: Crucible Books, 564 pp. ISBN 978-905472-04-8, hardback. Price £35.

Burroughs Wellcome & Co. became the largest pharmaceutical manufacturer in the United Kingdom. In doing so it had a major influence on the industry and, in particular, led the way in the field of marketing and medical research. This book traces the history of the company from its beginnings through the period between the wars when it was a leader in the field. The formation of the Wellcome Trust and its influence on research is explained. The more recent history is then examined, when increasing competition and difficulties that arose between the marketing and research arms of the company led to the company's decline.

Burroughs arrived in England in 1878 as the agent of John Wyeth and Brother. He started his business S.M. Burroughs & Co. in a small rented office near the Strand. He had gained valuable experience in Philadelphia selling compressed medicines and quickly sold the advantages of this new form of medicine, which were 'accuracy of dose, ready and entire solubility, and perfect preservation of drug', to his United Kingdom customers. He appreciated that the word 'tablet' was more acceptable than the term 'pill' used in America and he registered 'tablet' as a trade mark. Burroughs also recognised the commercial possibilities of Malt Extract which was just being introduced into Britain and he invested in the Kepler Malt Extract company, which he subsequently acquired.

Much of Burroughs' success was due to his introduction of the American selling methods and the successful use of the travellers employed by the

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company. The traditional means of selling at the time was the use of commission agents as salesmen. They did not have the interests of the company at heart, as there was no incentive to sell Burroughs medicines as opposed to any other lines they were detailing. This did not fit in with Burroughs' methods. By March 1879, the company was employing five of its own travellers on a full-time basis to promote their products.

The business steadily expanded and this led Burroughs to offer a partnership to Henry Wellcome, an American colleague, who was working at the time for McKesson and Robins. This offer was dependent on Wellcome being granted the exclusive agency for sugar-coated pills and other products of McKesson manufacture. This Wellcome was able to achieve and the partnership of Burroughs Wellcome & Co. was formed in 1880. Despite problems with the quality of McKesson and Robins products, which were subsequently discontinued, the company expanded the range of products they were able to supply. These were largely from American suppliers. Particularly successful was the range of pepsin and pancreatic extracts from Fairchild.

Initially the company had a monopoly in the supply of compressed tablets. However competition grew rapidly, and cheaper products, imported from other America manufacturers, placed the company at a disadvantage with their restrictive agency agreement. Their profits were severely affected by the new competition and it was decided to invest in manufacturing their own products, which enabled the company to improve its profitability and remain competitive. In addition they had a distinct commercial advantage because of their better marketing and sales methods. They also had advantages through innovation and quality control of their products, enabling the company to expand their range of products and ensure consistent quality. They went to considerable trouble and expense to register their trademarks and to defend their use. One of the more notable was the word 'Tabloid'.

Burroughs was a man of great energy and initiative. He produced many ideas for the company, but he lacked shrewd judgement and the care of detail, which were Wellcome's strengths. At the end of the 19th century the partnership came under a great deal of strain. Burroughs, on a world tour, made decisions and appointed agents without consulting Wellcome. Burroughs also tried to secure financial dominance of the company. These and other difficulties culminated in talks to dissolve the partnership, which was only avoided by the death of Burroughs in February 1895.

The First World War had a significant effect on the British drug industry. Many of the medicines in use in Britain were sourced from Germany, including Aspirin. Initially there was some difficulty in obtaining licences to manufacture drugs which had been patented by German companies. Once this difficulty was overcome, Burroughs & Wellcome manufactured Salvarsan and Neo-Salvarsan under the name Kharsivan and then went on to produce other drugs including aspirin, phenacetin, pyramidon, emetine bismuth iodide and others.

Boots took advantage of the increasing demand for chemicals to expand their fine chemical production. They employed a number of B.W. & Co. employees in order to gain the advantage of their expertise. The most damaging was when F.H. Carr transferred to Boots. He had been Head of the Chemical department since 1898 and Boots built a plant for the manufacture of fine chemicals headed by Carr. By 1917 they were manufacturing aspirin, phenacetin and atropine in direct competition with B.W. & Co.

In the period after the First World War one of the most significant developments was the formation of the Wellcome Foundation. This took control of the research laboratories, library and museum. Following the death of Wellcome in 1936, the Wellcome Trust was formed. According to his will, the Trust was responsible for the administration of the Wellcome Foundation, in addition to his personal fortune as well as managing the business, the research laboratories, library and museum and the other activities Wellcome was engaged in.

This post-war period was one of increasing difficulty. Competition increased and this was not helped by the culture within the company. Wellcome wanted to promote scientific research in order to advance medical knowledge. This led to research discoveries being published and then adopted by the company's competitors, to the disadvantage of the commercial advancement of the firm. A split grew between the commercial aims of the company, on whose success the funding of research depended and its public role, which lead to a reduction in the company's profitability and its relative decline.

Despite these later problems it has to be acknowledged that Burroughs Wellcome & Co. was at the heart of the development of our modern pharmaceutical industry. Its history and development are essential knowledge to an understanding of the industry in the United Kingdom. This book can be thoroughly recommended to anyone interest in the history of pharmacy and particularly, in the history of the pharmaceutical industry in Britain.

p.worling@virgin.net **Dr Peter M. Worling**

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Two Edwardian Face Cosmetics

Andrew Hardy* and Sally Pointer**

*Centre for Medical History, School of Humanities, and Social Sciences, University of Exeter

**National Museum & Gallery of Wales, Cathays Park, Cardiff

Queen Victoria was well known for her abhorrence of 'painting'.[1] However, she did maintain the services of a perruquier (wig-maker), who made up her cold creams and her (exclusive) flesh-toned face powder. Her influence affected the sale of cosmetics and even by 1905, four years after her death, the new Harrods store in London's Knightsbridge had very few cosmetics openly on sale. However, gradually the reticence about cosmetic purchase relaxed, especially as a new generation of fashionable Royal patrons, for example Queen Alexandra, were open about their fondness for cosmetic preparations. In 1907 Helena Rubinstein (1870–1965) arrived in London to open a beauty salon, whilst in 1910 in America Elizabeth Arden (1878–1966) started her cosmetic business, later opening her own London salon in 1922. Thus, when in 1908, the American Gordon Selfridge (1858–1947) opened his (huge) first London store it contained a vastly increased range of cosmetics for purchase by fashionable Londoners.[2] The rise of the mass marketing of cosmetics had begun. By the 1920s the use of cosmetics by millions of Western women, of all classes, had become both more acceptable and widespread, partly from the influence of Hollywood actresses,[3] and partly as more women entered the workplace and made decisions about the polished image they wished to project.

In a previous publication[4] we detailed the chemical composition of an Edwardian face cosmetic. Subsequently we obtained samples of two more such cosmetics. One, dated (by the RPSGB Museum) to 1890–1910, was a (rose-pink) rouge made by 'Bourjois of London/Paris' (Figure 1). The other sample, dated to c.1910 (again by the Museum), was an orange-pink face powder made by 'Areco Ltd. of London/Paris' (Figure 2).

The use, or not, of rouge was a common dilemma for the fashionable ladies of the early and middle Victorian period. Should one wear a modest amount of rouge – subtle and artful in application – and risk being found out (and thus being thought of as 'fast'/not-entirely-proper)? Or risk having no rouge and then perhaps being thought plain? However, by the 1890s the use of rouge by the young and the fashionable was becoming increasingly widespread. This continued into the Edwardian era, where the Victorian rose tints were often replaced by more yellow tones.[5]

In 1868 Monsieur and Madame Bourjois purchased the Paris-based cosmetic business of Joseph-Albert Ponsin, 'Maison Bourjois' as it

Fig. 1. "ROUGE Rosette Brune" sample
(© Ironbridge Gorge Museum Trust, Shropshire, UK).

became known, expanded the product range, but remained faithful to the brand's founding principles of 'good quality products for stage make-up and everyday make-up'. The name of the shade of one of their later 'blushers' (i.e. rouges) was 'Rosette Brune', a classic rose-pink colour. Our previously mentioned Bourjois sample is named 'ROUGE

Fig. 2. "Poudre de Riz Bonami" sample
(© Museum of the Royal Pharmaceutical Society, London, UK).

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Rosette Brune'. This shade is still available from Bourjois today, with 'the same original formula', but now named 'Cendre de Roses Brune.'[6]

Our second face cosmetic sample is named 'Poudre de Riz Bonami'; and its name implies the presence of 'powder of rice'. However, one author states that this 'powder of rice' was in fact always well-washed potato starch powder.[7] Another states that it came from China and was rice powder,[8] and yet another mentions that it was rice starch (i.e. the starch extracted from rice powder).[5] Whilst rice powder can be assumed to be chemically identical to rice flour (the latter being a finely ground and sifted form of the former); the same cannot be said for rice starch and potato starch.[9] Unfortunately we were unable to unearth any information on the company that made this cosmetic (Areco Ltd. of London/Paris) or any details on this particular face cosmetic.

The two face cosmetics were chemically analysed using the analytical techniques of LVSEM (Low Vacuum Scanning Electron Microscopy) and XRPD (X-Ray Powder Diffraction). The former gave quantitative elemental analysis on the samples, for atomic numbers (Z) of 6 and above; and the latter gave semi-quantitative results for the (crystalline) compounds present in the samples. For those readers wishing to know more about these two analytical techniques, especially as applied to cosmetic samples, we refer them to a recent publication by one of us.[10]

The LVSEM results were (in decreasing order of weight percent and with those elements at 1% or less being in brackets): O, C, Si, Mg, Ca, Zn, Al, Fe (Cu, Na, K, S) for the 'ROUGE Rosette Brune'; and O, Si, Mg, C (Al, Fe, Ca) for the 'Poudre de Riz Bonami'. The XRPD results were (with approximate percentages in brackets):

'ROUGE Rosette Brune'

Talc	$Mg_3Si_4O_{10}(OH)_2$	(81)
Calcite	$CaCO_3$	(11)
Zincite	ZnO	(4)
Kaolinite	$Al_2Si_2O_5(OH)_4$	(2)
Hematite	Fe_2O_3	(1)
Quartz	SiO_2	(1)

'Poudre de Riz Bonami'

Talc	(87)
Kaolinite	(7)
Unknown	(5)
Calcite	(1)

The above 'unknown' is thought to be perhaps either an Aluminium or Magnesium hydroxide (i.e. Brucite, $Mg(OH)_2$ or Nordstrandite, $Al(OH)_3$), or possibly another silicate.

The rose-pink colour of our Bourjois rouge sample was given by the presence of a small amount of Hematite, which was probably a component of some added calamine (i.e. Zincite plus Quartz plus Hematite). This is the same colourant as we found for the previously studied 'Freeman's Face Powder'.[4] However, for our other face cosmetic there was no evidence for the presence of an iron-containing colourant (i.e. Hematite or Goethite). We believe its colour (orange-pink) is caused by a very small amount of an organic colourant such as carmine, madder or even saffron; possibly as part of a lake pigment.[11]

A recipe for a typical coloured 'Poudre de Riz' face cosmetic of the Edwardian period is given by Koller[7] as follows:

Magnesia	MgO	500g	3.3%
Talc		4,500g	29.1%
Rice meal*		10,000g	64.6%
Various oils		250g	1.6%
Eau de Cologne		200g	1.3%
Carmine		20g	0.1%

*This is lightly ground rice grains; the 'precursor' to rice flour)

It is immediately clear just how little colourant is necessary to give the required tint, which can lead to difficulties in accurately identifying such colourants in later chemical analysis. Other face cosmetic recipes are also given in this reference: talc and/or rice meal/flour/starch are used as the powder's base and where the red/rose/pink colour was given by small amounts of carmine. Also, a named face cosmetic, 'Poudre de Riz de Java' (first produced by Bourjois of Paris in 1879), was analysed and found to contain 25.5% of zinc oxide and 74.5% of talc, but with no trace of any form of 'rice powder'. Similarly there was no evidence, from the XRPD data of our second sample, for the presence of any significant quantity of either rice flour[12] or of potato starch.[13] Clearly what the name implied as a primary ingredient of some face powders was not always what was actually used in their manufacture.

Historically, more noxious ingredients might be found in cosmetics. Ceruse, here taken to be White Lead, that is basic lead carbonate of formula: $2PbCO_3.Pb(OH)_2$, has had a long and often lethal history. Well known to the Romans, it was also used in England as a cosmetic base from at least the 1500s, reaching the height of its usage during the eighteenth century. Its poisonous properties were often well known, but it continued in use 'because it worked'. It **did** give a 'pale allure' to the skin plus good coverage (often using multiple layers to hide the scars of smallpox) and adhesion, and it could be easily coloured.[5] It was replaced, eventually, by safer alternatives such as talc and 'rice powder' (though warnings against lead survive in Victorian beauty manuals, suggesting it was not uncommon even at this late stage).

A good face cosmetic powder should have covering power (i.e. the required degree of opacity) to mask any skin defects such as scars, birthmarks, blemishes and broken blood vessels, whilst still ideally allowing natural (and assumed to be unblemished) skin colour to be seen. The most highly

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opaque material generally used now is titanium dioxide (TiO_2) (its pure white pigment form was first mass-produced in 1916), with zinc oxide and calcium carbonate being progressively less opaque, until for the most translucent coverings talc is/was used. Other attributes fora good face cosmetic are: a degree of absorbency (e.g. kaolinite or another clay); slip (i.e. the lubricant properties of such materials as talc); bloom (i.e. the matt, silky appearance given by such materials as chalk or starch); and adhesion (i.e. the ability to cling to the skin's surface, given by materials such as talc or insoluble soaps).[14]

Thus a comparison of the major components of the three Edwardian face cosmetics studied by us indicates that the previously studied 'Freeman's Face Powder'[4] was designed to be more opaque than the other two samples (as its percentage of zinc oxide was much higher). All three contained varying amounts of talc and kaolinite, but no observable amounts of insoluble soaps (i.e. zinc or magnesium stearates). That no ceruse/white lead was found indicates the relative safety of these cosmetics; and also perhaps shows that this noxious substance had finally been consigned to the 'dustbin of history'.[15]

The 'less-made-up' look requires less covering power (i.e. a high percentage of talc present), whilst the 'camouflage look' requires more opaque material (i.e. less talc and more zincite) to remove from sight the underlying skin. Which 'look' was used depended on both the current fashion and the user's (perceived) skin condition. For those who could afford it the first beauty salons aimed to deal with the latter, and sometimes even affected the fashionable trends in the process. However, as the containers of any purchased 'named brand' cosmetics did not then contain a list of the ingredients or specify the degree of coverage given, then the obtaining of a suitable face powder depended on 'experimentation in situ' and/or on helpful shop/beauty salon assistants.

Unscrupulous vendors certainly offered sub-standard or occasionally dangerous products, and part of the slow move towards the acceptability of cosmetics was the ongoing issue of inexperienced users being misled and subsequently disappointed by the products they used. Brand names of this period went to some pains to promote the 'suitableness' of their products, and it speaks well of our and other samples tested that the ingredients are/often were comparable to acceptable present-day ingredients.

Conclusions

Cosmetic usage is as old as vanity. Usage engenders positive feelings and various studies (e.g. reference 16) have shown that an increased attractiveness, real or imagined, does affect female lives socially and financially. Whether it was the increased chance of splendidly succeeding in the Edwardian 'marriage market' or an increased chance of promotion in the business world of a hundred years later, cosmetics 'work' for women.

Face cosmetics, plain or coloured, play an important part in this hunt for, and display of, 'attractiveness'. The two Edwardian face cosmetics studied here contain no toxic ingredients. One was coloured by an inorganic iron compound and the other (probably) by an organic colourant. Both contain high percentages of talc and so can be described as having a light/translucent coverage (rather than an opaque one); and so when used both would have given the 'natural look'/ 'less-made-up look'. They represent an important transition between the often dangerous, highly coloured preparations of a century earlier, and the well researched, highly tested mix of ingredients found in present-day coloured face cosmetics.

Acknowledgements

We would like to thank two museums for allowing us to access the two samples studied (and for the use of their images). The IronBridge Gorge Museum (Blists Hill, Telford, Shropshire, UK) for the 'ROUGE Rosette Brune'; and the Royal Pharmaceutical Society of Great Britain Museum for the 'Poudre de Riz Bonami'. Also, to the staff of the Chemical and Materials Analysis Unit (University of Newcastle, UK) for the LVSEM experimental work and for one of the XRPD data sets. The other XRPD data set was done at the Camborne School of Mines (University of Exeter in Cornwall, UK).

Authors' addresses: Corresponding author: Andrew Hardy BSc, DPhil, Centre for Medical History, School of Humanities and Social Sciences, University of Exeter, Exeter EX14 4RJ, UK. E-mail: A.D.Hardy@exeter.ac.uk; Sally Pointer BA (Hons), National Museum & Gallery of Wales, Cathays Park, Cardiff CF10 3NP. E-mail: Sally.Pointer@museumwales.ac.uk

Endnotes and References

1. In this context 'painting' is taken to mean the obvious, and excessive, use of face cosmetics which were based on poisonous (when ingested) heavy-metal (i.e. metals with a density of greater than 5 g/cm^3; such as lead or mercury) compounds, which were themselves coloured or could easily be coloured.
2. Woodhead, Lindy. *War Paint*. London: Virago Press, 2003: 72.
3. For example Theda Bara (1890–1955), who, with her well made up face and 'vamp' character, gave cinema audiences a different view of femininity.
4. Pointer, S and Hardy, A. Beauty Secrets of an Edwardian Lady. *Pharm Hist* 2005 (June); 35 (2): 27–30. The XRPD results obtained for the 'Freeman's Face Powder' were (%): Zincite (50); four Silicates (45) [Talc (16), Kaolinite (13), Pyrophyllite (11) and Muscovite (5)]; Quartz (2); Calcite (1); Hematite (1) and Aragonite (1).
5. Pointer, Sally. *The Artifice of Beauty*. Stroud, Glos.: Sutton Publishing Ltd, 2005.
6. We thank the Press Office contacts (Lesley Chivers and Sophie Williams) of Bourjois UK for sending us this information.
7. Koller, Theodor (translated from the German by Chas. Salter). *Cosmetics*, 3rd Edn. London: Scott, Greenwood & Son, 1920 (first published 1902).

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8. Angeloglou, Maggie. *A history of make-up*. London: Studio Vista Ltd, 1970: 109.
9. Starch is a polysaccharide carbohydrate obtained (mainly) from the maize/corn, rice, wheat or potato cereals. A polysaccharide consists of chains of saccharide units which are tens to hundreds of units long. These chains can be long and linear (giving amylose) or shorter and inter-linked/branched (giving amylopectin). The length, and degree of branching, defines a particular starch. Thus, a particular starch has particular percentages of amylose and amylopectin. A saccharide unit is $C_6H_{10}0_5$, and the formula for starch in general is sometimes given as $(C_6H_{10}O_5)_x$, where x is large and variable.
10. Hardy et al. Availability and chemical composition of traditional eye cosmetics ('kohls') used in the United Arab Emirates of Dubai, Sharjah, Ajman, Umm Al-Quwain, Ras Al-Khaimah, and Fujairah. *J Cosmet Sci* 2006 (Mar/Apr); 57: 107–125.
11. Lake pigments have been used since at least Roman times. They consist of an organic colourant (of vegetable or animal origin), such as carmine, absorbed onto a white, inert, insoluble inorganic compound (the 'binder'). This latter compound was, in the past, chalk or a clay or even crushed (animal) bones. Nowadays the compounds usually used are: barite ($BaSO_4$), gypsum ($CaSO_4.2H_2O$) or aluminium hydroxide ($Al(OH)_3$).
12. Mahadevamma, S and Tharanathan, RN. Processed rice starch characteristics and morphology. *Eur Food Res Technol* 2007; 225: 603–612.
13. Using data from the 2004 version of the JCPDS (Joint Committee of Powder Diffraction Data) database.
14. Simmons, John V. *Science and the Beauty Business,* 2nd Edn. London: Macmillan Press Ltd, 1995: 129.
15. Of the 88 'secret preparations for the skin and complexion' tested in reference 7 only *one* contained 'white lead'. Another five contained varying amounts of other lead compounds, i.e. lead carbonate, chloride or acetate.
16. Mulhern et al. Do cosmetics enhance female Caucasian facial attractiveness? *Int J Cosmet Sci* 2003; 25: 199–203.

Potatoes in Pharmacy

Dr Christiane Staiger
Neu-Isenburg, Germany

The tubers of *Solanum tuberosum* L. of the Solanaceae family is one of the world's most popular vegetables. Native to South America, it made its way to Europe and had a profound pharmaceutical career as a medical substance as well as an excipient.

The Origin in the Andes

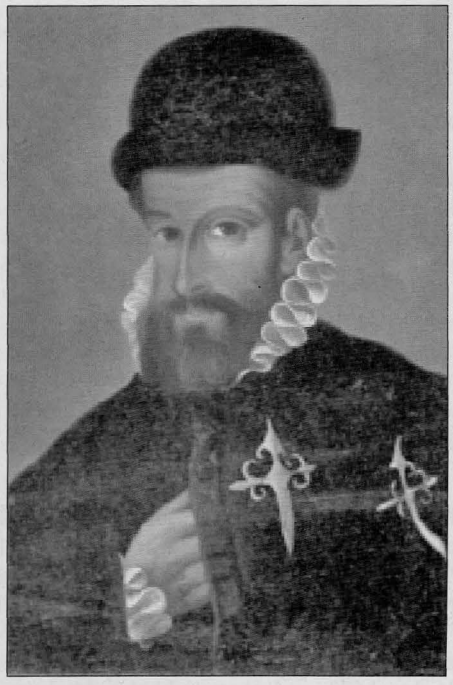
The origin of the potato lies several thousand years back in time in South America. Potato skins were found within a hearth at an archeological site in Chile dating to 11,000 BC.[1] The first archaeological evidence of potato cultivation is from approximately 5,000 years ago with the natives of Peru. Wild tubers have been found in the Andean plateau and mountainous regions.

In fact, the potato originated in the area of contemporary Peru and Bolivia, identified more specifically in 2005 as an area of southern modern day Peru, just north of Lake Titicaca.[2] With phylogenetic analyses of 362 individual wild and landrace members of the potato, a group of scientists could identify the genetic history of the plant. The people of ancient Peru developed several techniques to improve the production and storage of potatoes. Archaeologists have also found remains of a dehydrated potato product, called chuño.[3] To preserve the tubers for long-term storage, they were left on the ground to freeze during the cold nights. In the morning, they were trampled to remove the trapped moisture. This process of freeze-drying was repeated over a period of 4-5 days until all of the moisture was removed from the crushed potatoes. A potato flour, called tunta, was produced by a similar process.

The potato played an important part in the lives of the South American natives both as an everyday food and as a cultural influence. The Quechua language records more than one thousand words to describe potatoes and potato varieties. Particularly in highly elevated regions where corn and wheat would not grow, the potato became the primary food.

Ancient artefacts show that the people of the Andean highlands used potatoes as a theme in their art. Plotter pieces were made to resemble potatoes and sometimes showed potatoes with human characteristics. The potato was also believed to have medicinal qualities and was rubbed on the skin of sick patients as a remedy.

The importance of the potato in the lives of Andean natives is evident in the religious ceremonies created surrounding the tuber. Further, the Inca people



Portrait of Francisco Pizarro González (oil painting by an unknown artist) Source: http://de.wikipedia.org/wiki/Francisco_Pizarro

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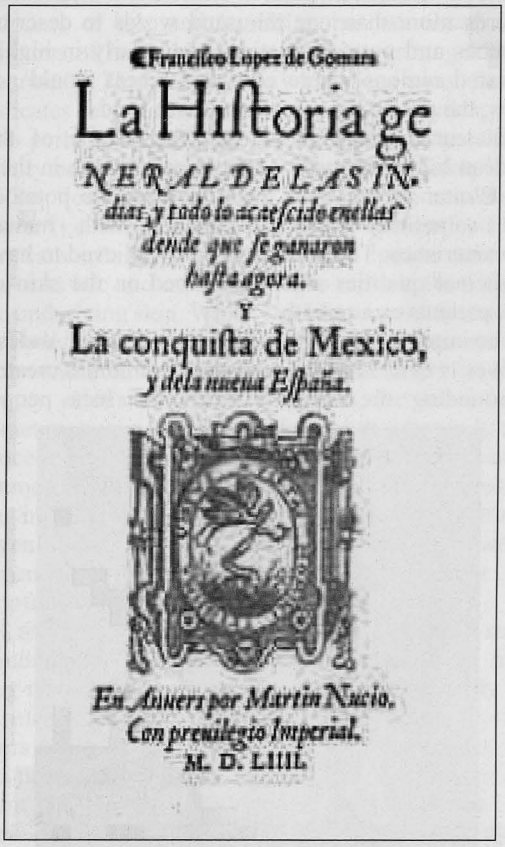
worshipped potato gods and celebrated rituals to ensure the success of their potato crops. Rituals and sacrifices were offered to appease the gods especially in times of need.

The early history of the potato in Europe

The potato found its way to Europe during the 16th century.[4] Although many crops were brought to Europe by Columbus and others soon after the discovery of the New World in 1492, the potato arrived several decades later. This is because Peru and the high Andes mountains were first discovered by Pizarro only in 1532, and potatoes were not mentioned for this region until Lopez de Gomara's account of 1552 and that of Cieza de Leon in 1553.[5] In what is now Colombia potatoes were first recorded in 1537. Thus, Europeans were first aware of the plant about 40 years after Columbus' discovery of the New World.


Francisco Lopez de Gomara

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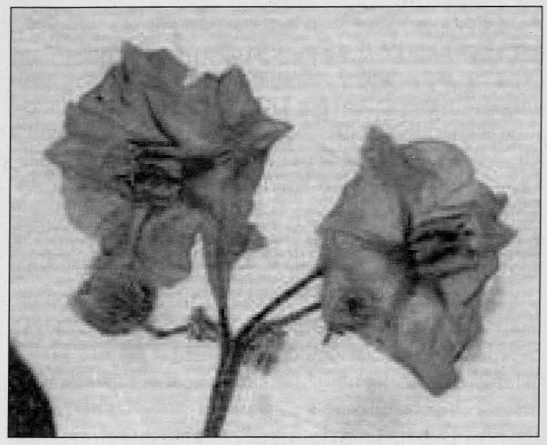
Title page of Lopez de Gomara's *La Historia General de las Indias*

In 1934, Hamilton found what has been thought to be the first records of the potato in Europe. In 1573 and 1576 the market archives of the Hospital de La Sangre in Seville, Spain mentioned the plant. These dates were used by historians as indicating that potatoes were already being grown in or around Seville by 1573 and that a likely date for this introduction could have been about 1570.

However, John Gregory Hawkes from Birmingham University did much work on the early history of the potato in Europe and he found evidence that the introduction of the plant from South America went via the Canary Isles, and not, as previously assumed, directly into continental Spain.[6] Hawkes and his group found records from November 28th 1567 in Las Palmas de Gran Canaria. Barrels of 'patatas', which are common potatoes, were exported from Gran Canaria to Antwerp and the bill of lading for goods mentions three medium-sized barrels containing potatoes, oranges and green lemons. The second record is from April 1574 referring to two barrels of potatoes that came from Tenerife and were shipped via Gran Canaria to Rouen in France. Thus, the potato was obviously being grown as a crop in Gran Canaria and Tenerife in 1567 and 1574, respectively. Taking into consideration that it would have needed some five years to bulk it up sufficiently as an export crop, it might well have been introduced in about 1562. This is only ten years after the first published account in 1552 by Lopez de Gomara, and only thirty years after its presumed first sighting in Peru by Pizarro in 1532.


Flower of *Solanum tuberosum* L from the Original Linnean Herbarium Source: http://linnaeus.nrm.se/botany/fbo/s/solan

Sweet Potatoes

For historians, one of the problems is to recognise in the literature whether the *Solanum tuberosum* potato or the *Ipomoea batatas* sweet potato is under discussion, or whether they are being confused with each other.

The sweet potato species is *Ipomoea batatas* and the botanical family is the bindweed or morning glory family, Convolvulaceae. Besides simple starches, sweet potatoes are rich in complex carbohydrates, dietary fibre, beta carotene, vitamin C, and vitamin B6. In 1992, the Center for Science in the Public Interest compared the nutritional value of sweet potatoes to other vegetables. Considering fibre content, complex carbohydrates, protein, vitamins, iron, and potassium, the sweet potato ranked highest in nutritional value. According to these criteria, sweet potatoes earned 184 points, 100 points over the next on the list, the common potato.[7]

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Hawkes and his team have found evidence, that the early Spanish authors always seemed to have clearly distinguished between the two potato types and that the Canarian and the Seville records refer indeed to the *Solanum* potato.

The focus of this paper is the common potato, *Solanum tuberosum*. The nutritional value, as mentioned before, is also quite remarkable.[8] Raw potatoes with peel contain a number of important vitamins and minerals, in particular high amounts of Vitamin B_6 and C. Nutritionally, potatoes are best known for their carbohydrate content. Starch is the predominant form; potatoes contain about 15%. A small but significant portion of the starch in potatoes is resistant to enzymatic digestion in the stomach and small intestine and, thus, reaches the large intestine essentially intact. This resistant starch is considered to have physiological effects and health benefits similar to fibre: e.g. to offer protection against colon cancer; improve glucose tolerance and insulin sensitivity; and lower plasma cholesterol and triglyceride concentrations. However, not all of the valuable ingredients are stable at higher temperatures; thus the cooking method used can significantly impact the nutrient availability of the potato.

Spreading across Europe

From Spain, potatoes slowly spread to Italy and other European countries during the late 1500s. By 1600, the potato had entered Spain, Italy, Austria, Belgium, Holland, France, Switzerland, England, Germany,[9] Portugal and Ireland. But at first, it did not receive a warm welcome. Potatoes were regarded with suspicion, distaste and fear. They were primarily grown in botanical gardens as an exotic novelty, also for the nice flowers, but not considered for human consumption. In many European countries, the potato carried a social stigma as the food of savages and peasants. Yet in England, the tuber was so despised during the reign of George III (reigned 1760-1820) that it took years of botanical experiments before people conceded that potatoes might be acceptable, but as cattle feed.

However, the potato spread around the continent. Documents show that in Belgium in 1587, the Prefect of Mons, Felipe Sivry, received potatoes as a gift from a friend of the Vatican ambassador. He had brought them from Italy where they had arrived via Spain.

The following year, the Belgian official sent some potato tubers and a berry to the botanist Carolus Clusius (1526-1609), living in Vienna. Clusius is commonly famous for introducing the tulip to the Netherlands. In 1589, Sivry sent Clusius another gift, a watercolour of a potato plant that he had painted. The following year Clusius received two more illustrations of potatoes from the Swiss botanist Pierre Bahuin. In 1596, Bahuin published his book *Phytopinax*, which described the potato for the first time as *Solanum tuberosum*, the name still used today.

John Gerard, holding a potato flower, from the frontispice of *The Herball* (1636).
Source:http://commons.wikimedia.org/wiki/Image:Gerard_John_1545-1612.jpg

Clusius's major work, *Rariorum plantarum historia* of 1601, contains a description of rare and exotic plants, including the potato. His description of 'Papas Peruanorum' is remarkably precise in matters of morphology.

John Gerard

The first description of the potato in English appears in *The Herball or Generall Historie of Plantes* (1597) by John Gerard (1545-1612), who corresponded with Clusius and provided him with samples. Gerard mistakenly thought the white potato to be native to America, calling it the 'Virginian Potato' to distinguish it from the red sweet potato. On the title page he appears in a noble costume, in his hands a potato bough with a large flower.

> Virginia potatoes hath many hollowe flexible branches trailing uppon the grounde.., the whole leafe resembling those of the Parsnep … whereon do grow very faire and pleasant flowers, made of a entirely whole leafe, which is folded or plaited in such strange sort, that it seemeth to be a flower made of sixe sundrie small leaves … The whole flower is of a light purple colour.[10]

The potato made its way further around the world. In 1613, the British took the tuber to Bermuda. From there it was shipped in 1621 to Virginia, in Britain's American colonies. Further, historical and genetic evidence suggests that the plant reached India not very much later than Europe, taken there by either the British or the Portuguese.

In the mid-18th century, Frederick the Great of Prussia (1712-1786) saw the potato's potential to help feed his nation and lower the price of bread, but

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faced the challenge of overcoming the people's prejudice against the plant. An anecdote tells that he used a bit of reverse psychology to encourage his subjects' interest in the crop: he placed a royal acre of potato plants and stationed a guard to protect the field. Nearby peasants naturally assumed that anything worth guarding was worth stealing, and so snuck into the field and snatched the plants for their home gardens. Of course, this was entirely in line with Frederick's wishes and the guards had order to ignore the thieves.

Beside this anecdote, the breakthrough of the crop growing in Prussia came with a royal decree in 1756. Farmers were commanded to cultivate potatoes in their fields:

> Es ist Uns in höchster Person in Unsern und anderrn Provintzien die Anpflanzung der sogenannten Tartoffeln, als ein nützliches und so wohl für Menschen, als Vieh auf sehr vielfache Art dienliches Erd Gewächse, ernstlich anbefohlen.[11]

Antoine-Augustin Parmentier

It is a pharmacist, who is remembered as a vocal promoter of cultivating the potato as a food source for humans in France and throughout Europe. Antoine-Augustin Parmentier (1737-1813) served as a French military pharmacist. During the Seven Years' War, he was captured, and in prison in Prussia was faced with eating only potatoes for two weeks. In the article of Brian Block, comprehensive information about the life of this outstanding pharmacist is given.[12] After his return to Paris, the prison experience came to Parmentier's mind in 1772 when he proposed to use potatoes as a source of nourishment and breadmaking. The same year, the Paris Faculty of Medicine declared potatoes edible.

In popular history articles, Partmentier is mentioned as the inventor or the populariser of the potato, but he was certainly not the first and only one who promoted the crop in France. Two other Frenchmen, Duhamel du Monceau and Mustel have an earlier claim than Parmentier, even in the making of bread from potatoes. But, as Block states, both did little work on the potato, each published a paper and went on to do something else. Parmentier however, worked on various aspects of the potato and its use in breadmaking, refining and publishing his results until the topic was exhausted. Later, even the cavaliers at court inserted a potato flower to their buttonhole.

Potato famine

But potato history was not always that glamorous. A much more tragic chapter is related to Ireland. There, the common potato found a perfect growing climate and the Irish people quickly embraced the crop as the common daily food. Poorer parts of the country relied entirely on the potato. But in 1845 the blight appeared. The blight was the fungus Phytophthora infestans and was responsible for several crop failures until the early 1850s. During the Great Hunger or Irish Potato Famine the population of the island was reduced by 20 to 25 percent; almost one million people died. The famine triggered the emmigration of another one million, mostly to Canada and the United States.

Potato Year 2008

However, the potato is today one of the most important crops of the world. 2008 is the official International Year of the Potato proclaimed by the United Nations.[13] The mission of this International Year of the Potato is

> to increase awareness of the importance of the potato as a food in developing nations, and promote research and development of potato-based systems as a means of contributing to achievement of the United Nations Millennium Development Goals. Over the next two decades, the world's population is expected to grow on average by more than 100 million people a year. More than 95 percent of that increase will occur in the developing countries, where pressure on land and water is already intense. A key challenge facing the international community is, therefore, to ensure food security for present and future generations, while protecting the natural resource base on which we all depend. The potato will be an important part of efforts to meet those challenges.

2008 has also been designated the National Year of the Potato in Peru.[14]

Medicinal use

The potato when first introduced into Europe was a novelty and sold for a high price, and used as medicine.[15]

It was supposed to be an aphrodisiac useful in curing impotence or as an ingredient in love philtres.[16] William Salmon (1644-1713), in *The English Herbal or History of Plants* printed 1710 praised potatoes highly claiming they stopped 'fluxes of the bowel and could cure tuberculosis and rabies.' He also promoted their aphrodisiacal qualities, asserting that eating potatoes would 'increase seed and provoke lust, causing fruitfulness in both sexes.' In the literature it is also stated that Shakespeare mentions potatoes twice – once in the *Merry Wives of Windsor*, and once in *Troilus and Cressida.* It is scientifically proven that Shakespeare referred to the sweet potato. However, as sweet potatoes do not grow in the British Isles, several may have used the common potato instead in pre-Viagra times.

Raw potato water was recommended against gastric ulcers, which seems to make sense, as the pH-value of potatoes and potato water is alkaline.[17] For the same reason it was also recommended as a soap, for example by another famous pharmacist, Tobias Lowitz (1757-1804).[18]

In the *Curious Cures of Old England* is mentioned that for headaches one should apply a poultice of raw potatoes to the temples, and cramp could be prevented by putting a potato under the mattress.[19]

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The book *Curious Cures of Old Yorkshire* recommends putting a little lump of hot potato in the ear for earache, and against sore throat apply boiled, mashed poatoes wrapped in a stocking. Olive or camphorated oil could be added to the outside of the stocking, then wrapped around the throat.[20] These applications refer to the good heat store qualities of the hot potato and seem to offer in fact some help.

In 2006, I asked our late friend Bill Jackson if he knew other less rational medical virtues of potatoes and he wrote me a sincere letter with further information:

> My old G.P. cured some warts on the hand of his sons by cutting a potato in half, rubbing the warts with the cut surface, then burying the potato in his garden. The 'cure' was successful and the warts disappeared. Audrey's grandmother always carried a potato in the pocket of her apron as a preventative from or a cure for rheumatism.[21]

Another not evidence-based use suggests putting potato slices on broken bones. During the 1920s, several plants have been examined as a possible source of insulin, including the potato.[22] As we know today, potaoes are not a 'vegetable source' for insulin. However, they are always mentioned when it comes to administering a proper diet for patients suffering from diabetes. Further, potato diets were recommended for an abundant number of complaints.

> Such a diet has been found to possess remarkable powers of clearing away colds, fevers, bronchial and digestive troubles which, for the most part, are due to an excess of acid poison waste in the system. Obstinate skin disease of an intractable type and chronic nettlerash will yield to it when all other forms of treatment have failed. Influenza yields to potato treatment in four days, while rheumatic fever clears up in eight days.[23]

Finally, Gyll Mothorby reported in his book of 1775, that in Sweden leaves of the potato plants were manufactured for smoking instead of tobacco.[24]

The idea that potatoes may help one to fall asleep is probably related to the alkaloid content of crude tubers, leaves, flowers and in particular the fruits of the plant. The glycoalkaloids, namely solanine and chaconine, may cause headaches, diarrhea, cramps and in severe cases coma and death.[25] However, poisoning from potatoes occurs very rarely.

Starch

From a pharmaceutical point of view, the potato is not a magic active ingredient. But it made a much more successful career as an excipient. Some readers may remember viewing different types of starch through the microscope. Rice starch is the smallest, corn and wheat are also different, but potato starch can be identified by irregularly shaped, ovoid or pear-shaped granules showing clearly visible concentric striations. Starch is used as an excipient primarily in oral solid-dosage formulations where it is utilised as a binder, diluent, and disintegrant. Starch is also used in dry-filled capsule formulations for volume adjustment of the fill matrix. Further, freshly prepared starch paste is used at concentrations of 5-25% in tablet granulations as a binder.

However, wafer-capsules (or cachets) have been the main dosage form for potato or rice starch.[26] The French retail pharmacist, Stanislas Limousin (1831-1887) introduced many devices into pharmacy and medicine, among them the medicine dropper, an apparatus for the inhalation and therapeutic administration of oxygen; and most importantly the invention of glass ampoules that could be sealed and sterilised. The cachet has been another great contribution.

It seems that starch capsules may face a return to modern pharmacy by those seeking alternatives for gelatin, which is an animal excipient. Modern processing feeds starch – in the form of powder, granules or pellets – through the hopper onto a rotating screw.[27] The feed material moves along the screw towards the tip and the temperature is continuously increased. From the feed zone to the compression zone, the feed material is melted down and injected into the mould with preasure and the capsules are formed. The time for a complete cycle is usually only a few seconds; body and cap of the capsules are produced separately.

A US Patent issued November 2003 describes flavoured vegetable starch capsules, flavoured e.g. with strawberry, chocolate, cocoa, vanilla, lemon, coconut, peppermint, banana, or even chili pepper in order to improve the palatability of fish oil or medicinals.[28] Starch has been also been investigated as an excipient in novel drug delivery systems for nasal, oral, periodontal, and other site-specific delivery systems.

Due to the starch content, potatoes can also easily be converted into vodka or alcohol, which is also a pharmaceutical excipient. In Ireland, illegally produced whiskey had been known as poteen or potheen, which normally contains a certain amount of methyl alcohol. It was also brought into England in bottles labelled 'Holy Water'.[29] However, it would go beyond the scope of this paper to explain the virtues and properties of ethanol in medicine and pharmacy in detail.

Vaccination

Another very modern use of the potato in medicine is oral vaccination. In 2007, scientists showed that, for hepatitis B vaccine, genetically modified potatoes may be an alternative to the syringe and needle. Previously, researchers showed that potatoes can deliver vaccines for intestinal pathogens such as *E. coli* and Norwalk viruses, which enter the body via the mouth.[30]

It is a four-step procedure: First, a gene from a human pathogen is inserted into a bacterium that infects plants. Second, the bacteria infects potato leaf segments; third the leaf segments sprout into whole plants containing the gene for human pathogen, and

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finally eating the raw potato triggers immune response to the pathogen.

Clinical trials are already on the way. For the clinical trial, the researchers genetically modified potatoes to carry the gene for the hepatitis B surface antigen. The antigen as a foreign substance, namely a protein, is absorbed by the body, and triggers an immune response. In the trial of 42 participants previously inoculated with the traditional hepatitis B vaccine, about 60 percent showed signs of boosted immunity after eating bite-size pieces of raw genetically modified spuds.[31]

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Author's address: ch.staiger@gmx.de

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Scotland and Medicine in Print - a new internet source

The Scottish Museums Council maintain the web site www.scotlandandmedicine.com this gives details of the many resources for research into medicine in Scotland, including information on current exhibitions, museum displays and exhibitions currently open to the public.

In association with the Royal College of Surgeons an internet exhibition entitled 'Scotland and Medicine in Print' was opened in August 2008. This exhibition, part of the celebrations of 500 years of printing in Scotland, shows examples of the printing and publishing of medical and health-related literature in Scotland, over the past 500 years. Access to this exhibition can be gained either through the above web site or directly at *www.scotlandandmedicineinprint.com* Under the heading 'More Collections' some one hundred and eleven publications are illustrated and described as well as details of where the publication is held. Object number 4 is *Ane breve descriptioun of the pest quhair in the causis signis and sum special preservation and cure theirof ar contenit.* This, the first medical book printed in Scotland written in Scot, is the subject of an article published in the Historian (2009; 38: 14).

The web page Scotland and Medicine in Print also gives information on two other exhibitions being held to celebrate five hundred years of printing.

Dr Peter M. Worling

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Aerated Waters: from natural to carbonated

Peter G Homan, FRPharmS
Epsom, Surrey

Magical properties were long ago associated with natural waters and springs. Early physicians recognised that these natural waters contained a 'subtle spirit' that gave waters a refreshing taste and imparted a feeling of vitality. This spirit was assigned a variety of names including *Spiritus Silvestris*, *Gas Sylvestre*, *The Soul of the Waters* and an *Elastic Aethered Spirit.*

Belief in the medicinal and healing properties of these waters spread and people went in search of cures. Demand was created for the waters to be available everywhere but transporting them was a problem: firstly they seemed to lose the lively taste, and secondly the ingredients appeared to leave the water in the form of a sediment. It was believed that the gas evolved by the waters was a powerful aid to its efficacy and searches were begun to identify this magical ingredient to enable the creation of artificial waters.

In the 1440s Michael Savanorola, an Italian physician, wrote a treatise on the hot baths of Italy. In 1560 Dr William Turner wrote an account of the waters at Bath. In 1572 Dr Jones, a physician from Derby, expounded the virtues of the waters at Buxton, and in 1602, Jacob Theodore mentioned a number of German mineral waters, including the famous Seltzer Water. None of these gentlemen made any attempt to analyse or comment on the contents of these waters.

The first mention of an ingredient is from Dr Thomas Guidott, a Somerset physician, who in 1676 wrote *A Discourse of Bathe and the Hot Waters there* in which he states 'I am apt to believe that great part of the acidity is breathed off in evaporation'.

In the 1660s the chemist Robert Boyle increased the knowledge of chemical analytical research. He discovered a number of indicators for acids including syrup of violets which turned red in acids. Mineral waters, it was found, were acid but lost this property on standing as well as producing a precipitate which was not acid. In1685 Boyle published a book *Short Memoirs for the Natural Experimental History of Mineral Waters* in which he included 47 chapters, each with one method of examination.

In 1726 Frederick Hoffman, 'a most excellent and consumnate physician and curious chymist' wrote that mineral waters consisted of three parts:

> 1) a very subtile [sic] matter – in all probability an extremely moveable or subtile [sic] aether
>
> 2) of moisture or what for distinction's sake may be called elemental water.
>
> 3) Of a solid body, whether of an earth or saline nature.

He ascribed the most extravagant virtues to the first ingredient:

> this noble, native spirit, it is, which by its penetrating nature and admirable faculty, renders itself perceptible to the smell and the sense; not only affording a grateful odour in its exhalation, but also filling the whole head therewith. This principle we take for their {mineral waters} most curious and effective part, or as it were the soul.

In the 1740s two men wrote notes on Pyrmont Water, found at Bad Pyrmont in Lower Saxony in Germany. F.G.P. Seif and a Dr George Turner described the 'spirit' of Pyrmont water as an agent holding the ingredients of the water together because they precipitate on standing. Both recognised the similarity of the gas to the noxious exhalations of caves such as the Grotto del Cane, the gas issuing from mineral springs and the gas produced by fermenting liquors. Animals and man had been asphyxiated both in Italy and at Pyrmont.

The first complete analysis of a mineral water is attributed to a Dr Chrouet who, in 1713, analysed the waters at Spa in Belgium. He had a special pewter still to collect the vapour given off by the Spa water. He was convinced that the gas was air and not combustible spirits and that it was of such a nature that it was acidic and able to combine with potash. He called it **aerial acid**.

An English translation of his analysis of the water reads:

> Thus a bottle of this water comes as a medicinal potion ready prepared from the bosom of the Earth, being composed of a great quantity of this **airy acid** lightly stuck to our salts, sulphurs, and to the matter of four grains of **Mars** (iron) divided into a million parts, of six grains of **double salt** (aluminium potassium sulphate), of seven and a half grains of **metallick** [sic] **sulphur** (iron sulphide), and of a sample of a **sulphurous spirit** (sulphurous acid).

Sometime before 1750 Monsieur G.F. Venel, a professor of chemistry in Montpellier, believed that the aerial acid was an extra part of the contained gas, as the amount of air in mineral water that had been standing, contained the same amount of air as ordinary solutions of chemicals. He found that by adding sulphuric acid until the deposits had been dissolved, in a closed vessel, the vitality of the water was restored. He later added an amount of sodium carbonate to water to just detect the taste then added a small quantity of hydrochloric acid – the result was a liquid with a taste that resembled Seltzer water.

The simplest way to reproduce mineral waters was to evaporate the natural water then re-dissolve the residue in sufficient plain water. This method was successfully carried out by Nehemiah Grew on the waters at Epsom and he marketed the product as Epsom Salt. Similarly, Hoffman extracted the same salt from Seidlitz water. Chemists could increasingly determine the contents of mineral waters by chemical analysis, but the quest was to add the sparkling vitality of the water. Hoffman tried to produce the sparkle by adding alkali and acid, but shaking to dissolve the ingredients dissipated the gas.

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As stated earlier, Dr Seif found that the vapour given off by the water at Pyrmont in Germany was similar to the noxious fumes at Grotto del Cane in Italy. It was Dr William Brownrigg who identified the vapour. Brownrigg was a physician in Whitehaven, in Cumbria. He investigated damps, vapours present in coalmines. He concluded that it was these vapours that impregnated the underground water to impart the taste and effervescence and was the same vapour as found in Pyrmont and the Grotto del Carne. He also detected that the vapour was acid.

In 1752, Joseph Black, who would later become Chair of Chemistry at the University of Edinburgh, was researching the cause of causticity of lime and the effects of heat and acid on chalk. He found that both effects had the same result of driving off a gas which he named as **fixed air.**

Henry Cavendish, the English chemist and physicist, discovered that water could dissolve slightly more than its own volume of fixed air at room temperature and rather more at lower temperatures or under pressure, and that this combination could dissolve calcium carbonate while, at the same time, producing more fixed air.

In 1767, Joseph Priestley started experiments on fixed air which he could find in abundance as he worked very close to a brewery. He added very little knowledge to the subject but confirmed other people's experiments and declared fixed air to be a combination of oxygen and phlogiston (a hypothetical element that was said to be given off when a substance was burnt). The 'phlogiston' in the case of fixed air was, in fact, a black substance which Priestley was not prepared to identify as carbon – this task was completed by Lavoisier who proved that fixed air was a combination of 24% carbon and 76% oxygen. Lavoisier renamed fixed air as **Carbonic Acid.**

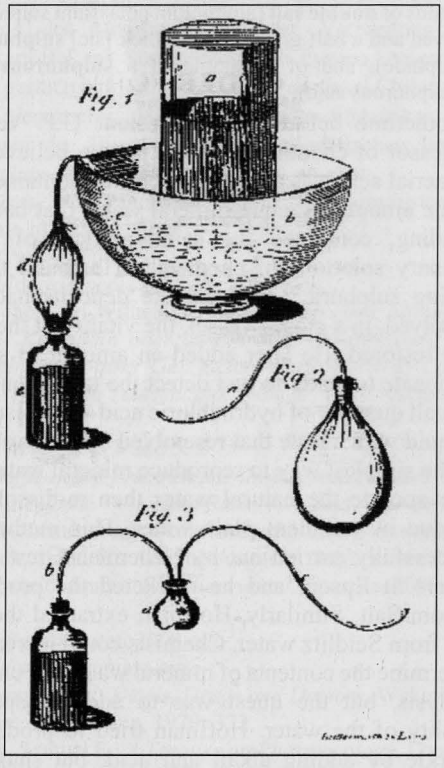

Figure 1. Priestley's apparatus.

It is thought that the first person to aerate water with carbon dioxide was Brownrigg, although he never published a paper. The gases from the local mine were passed to his laboratory by pipes and it may be inferred that aeration was effected by passing the gases directly into water. Venel had tried by adding hydrochloric acid and sodium carbonate but subsidiary products were left in the water.

Joseph Priestley first impregnated water by leaving it near the surface of beer in fermenting vats. In 1772 he used chalk and acid. At about the same time he heard of the work of Dr. Charles Irving, a naval surgeon and inventor from London, who produced distilled water from seawater. Priestley worked on a method of impregnating this water with carbonic acid gas and to use it for the prevention and cure of scurvy – an idea put forward by Dr David Macbride. Priestley produced an apparatus (see Fig. 1) that was accepted by the Admiralty and installed on two ships. He later produced a pamphlet which described his apparatus and how to use it.

> The bottle contains chalk just covered with water. Add sulphuric acid, press air out of bladder, cork bottle, allow a little time to expel air, then insert pipe. When half full of air, agitate. Allow to fill again and agitate. Cork and remove bottle.

The disadvantage was that although atmospheric air was removed, acid vapours were not.

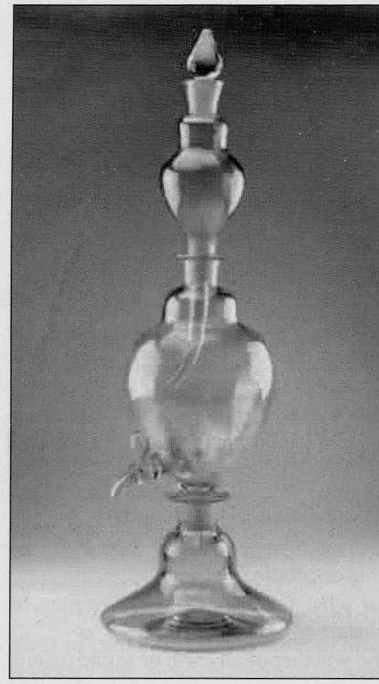

Figure 2. Nooth's Gazogene

Lavoisier took this a stage further by adding a funnel with a valve to control the amount of acid added. Purification was done by passing the gas through water to remove sulphuric acid and through a vessel containing lime and water to remove other impurities.

In 1775, Dr Nooth introduced what he called a Gazogene (see Fig. 2) for

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making small quantities of aerated water. Gas was generated in the bottom chamber from chalk and sulphuric acid. It passed through a one-way valve to aerate water in the chamber above. Displaced water was returned via a bent tube into the aerated water.

In 1781, Thomas Henry, an apothecary from Manchester, produced an apparatus that could produce 10 to 12 gallons of aerated water in one operation. With his apparatus he prepared Pyrmont water, Seltzer water and something called Mr Bewley's mephitic julep.

His formula for Pyrmont Water was:

> To every gallon of spring water add one scruple of magnesia alba (magnesium carbonate), 30 grains of Epsom Salts (magnesium sulphate), 10 grains of common salt, and a few pieces of iron wire or iron filings. The operation is then to proceed as in the process for impregnating water with fixed air; and the water, if intended for keeping, must be put into bottles, closely corked and sealed.

Seltzer water contained magnesium carbonate, sodium carbonate and salt. Mr Bewley's mephitic julep contained sodium carbonate and the instruction was to take four fluid ounces with a draught of lemonade or vinegar water by which means the gas could be released in the stomach. This was probably the first 'Soda Water'. The first mention of Soda Water was by Tiberius Cavallo, a member of the Royal Society, in about 1798, when he stated

> the soda water which is now prepared and sold in London by a Mr Schweppe, contains an incomparably greater proportion of carbonic acid gas.

One refinement of Henry's apparatus was performed by the famous inventor James Watt. It was a hydraulic bellows or gasometer to receive and store the gas produced.

The 1790s saw a sharp increase in the manufacture of artificial water, including Johann Schweppe's Soda Water and later his tonic water. Pumps were introduced and glass bottles replaced earthenware bottles. Bottles were filled using pressure and agitation. Specialised bottles were invented such as that by Hiram Codd that had a marble built into the bottle. The bottle would be filled and the pressure would hold the marble in the neck. A wooden apparatus would release the marble for emptying the contents.

Continuous machines were produced to be used in pharmacies to make their own brands of mineral water. One such apparatus, as recommended in the Pharmaceutical Journal of 1849/50, is illustrated

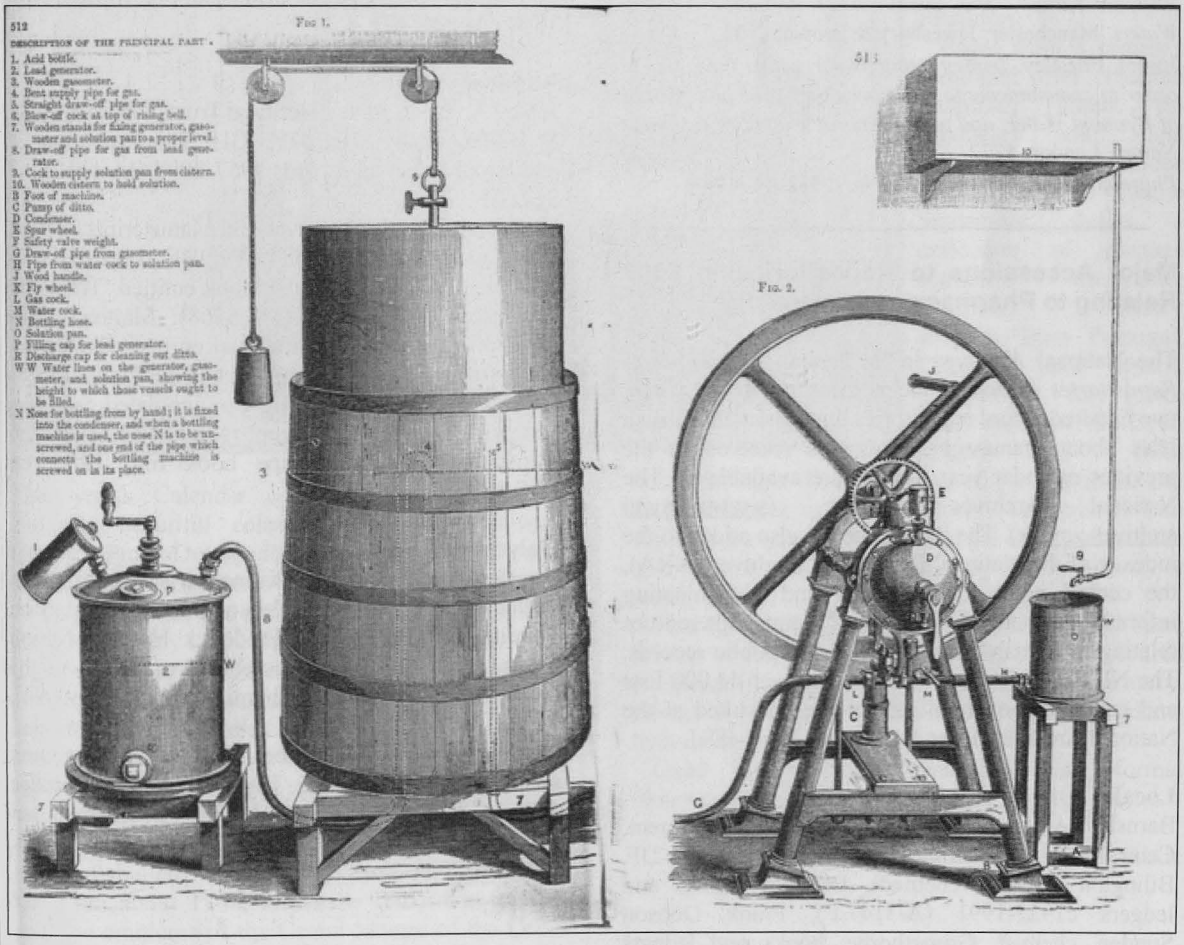

Figure 3. Mineral water apparatus

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(Fig. 3). It was recommended that the man carrying out the task of bottling should wear a thick woollen sweater as the bottle might shatter when being filled.

Other machines were developed for the over-the-counter sales of carbonated drinks, produced in the pharmacy using flavoured syrups.

For production at home of small quantities of aerated water the gazogene was further developed by various manufacturers using mainly tartaric acid and sodium bicarbonate to produce the carbon dioxide. These were eventually replaced by the soda syphon with its charged mini-cylinders of carbon dioxide. Other variations have included the 'SodaStream' apparatus that carbonates water that has been flavoured with a concentrated syrup.

I cannot finish without mentioning a famous pharmacist who was arguably the worlds greatest beneficiary from the discovery of aerial acid, John S Pemberton, the inventor of Coca-Cola.

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Author's address: Peter Homan, 3 The Ridings, Epsom, Surrey, KT18 5JQ; peter.homan@lineone.net

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Joseph Priestley. *Impregnating Water with Fixed Air; in order to communicate to it the peculiar Spirit and Virtues of Pyrmont Water, and other Mineral Waters of a similar Nature.* London, 1772.

Pharmaceutical Journal, 1849/50; 9: 512.

Major Accessions to Repositories in 2007 Relating to Pharmacy and Chemistry

The National Archives in its annual *Accessions to Repositories* exercise collects information from over two hundred record repositories throughout the British Isles about manuscript accessions received in the previous calendar year. Details are available on The National Archives website (www.nationalarchives.gov.uk). The information is also added to the indexes of the National Register of Archives (NRA), the central point for collecting and disseminating information about the location of manuscript sources relating to British history outside the public records. The NRA, which currently contains over 44,000 lists and catalogues of archives, can be consulted at the National Archives, Kew, Richmond, TW9 4DU.

Local

Barnsley Archive and Local Studies Department, Central Library, Shambles Street, Barnsley S70 2JF. Bilington & Sons, chemists, Barnsley: books and ledgers c1922-1991 (A/3147/F); Frank Dobson Sugden, chemist, Grimethorpe: books and ledgers c1922-1991 (A/3147/F)

Bolton Archive and Local Studies Service, Civic Centre, Le Mans Crescent, Bolton BL1 1SE. FM Hughes, dispensing chemist, Bolton: business records c1940-1959 (ZZ)

Centre for Buckinghamshire Studies, County Hall, Walton Street, Aylesbury, Buckinghamshire HP20 1UU. FJ Janes, chemists, Aylesbury: prescription book 1844-59 (D-X 1824)

Leicestershire, Leicester and Rutland, Record Office, Long Street, Wigston Magna, Leicester LE18 2AH. JL Bradley, chemists, Leicester: records incl prescriptions book, poisons registers and advertising material 1933-1980 (DE7280)

Peterborough Archives Service, Peterborough Central Library, Broadway, Peterborough PE1 1RX. Sturton & Sons Ltd, chemists, Peterborough: prescription books and accounts 1898-1975

Tyne and Wear Archives Service, Blandford House, Blandford Square, Newcastle Upon Tyne NE1 4JA. Brady & Martin Ltd, pharmaceutical, wholesale and manufacturing chemists and surgical instrument makers, Newcastle upon Tyne: minute book 1903-62 (DX1261)

West Sussex Record Office, Sherburne House, 3 Orchard Street, Chichester, West Sussex PO19 1RN. TJ Palmer, chemist, East Grinstead: prescription book 1864 (Acc14747)

National

Jersey Archive, Jersey Heritage Trust, Clarence Road, St Helier, Jersey JE2 4JY. GHF Flory, pharmacist: additional financial records 1957-2003 (JA/1312)

Special

Wellcome Library, Archives and Manuscripts Section, 183 Euston Road, London NW1 2BE. Lewis Herbert Llewellyn, pharmacist: scrapbook entitled 'Trials of a Pharmacist' 1916-1932 (MS.8568); Marthe Louise Vogt, pharmacologist: additional corresp, diaries and photographs, rel to Marthe Vogt and her family c1890-1960 (PP/MLV); Bath Drug Co: annotated catalogue and price list early 20th cent (MS.8567); HJ Logan, dispensing chemist: recipe book mid 19th cent (MS.8495)

University

Birmingham University Information Services, Special Collections Department, Main Library, Edgbaston, Birmingham B15 2TT. Frederick Howard Newth, lecturer in Chemistry: notebooks (5) rel to his undergraduate courses in chemistry and botany 1941-1943 (USS34)

Dundee University Archive, Records Management and Museum Services, Tower Building, Dundee, Angus DD1 4HN. RG McKenzie, chemist and optician, Dundee: prescription registers 1932-1952 (2007/268)

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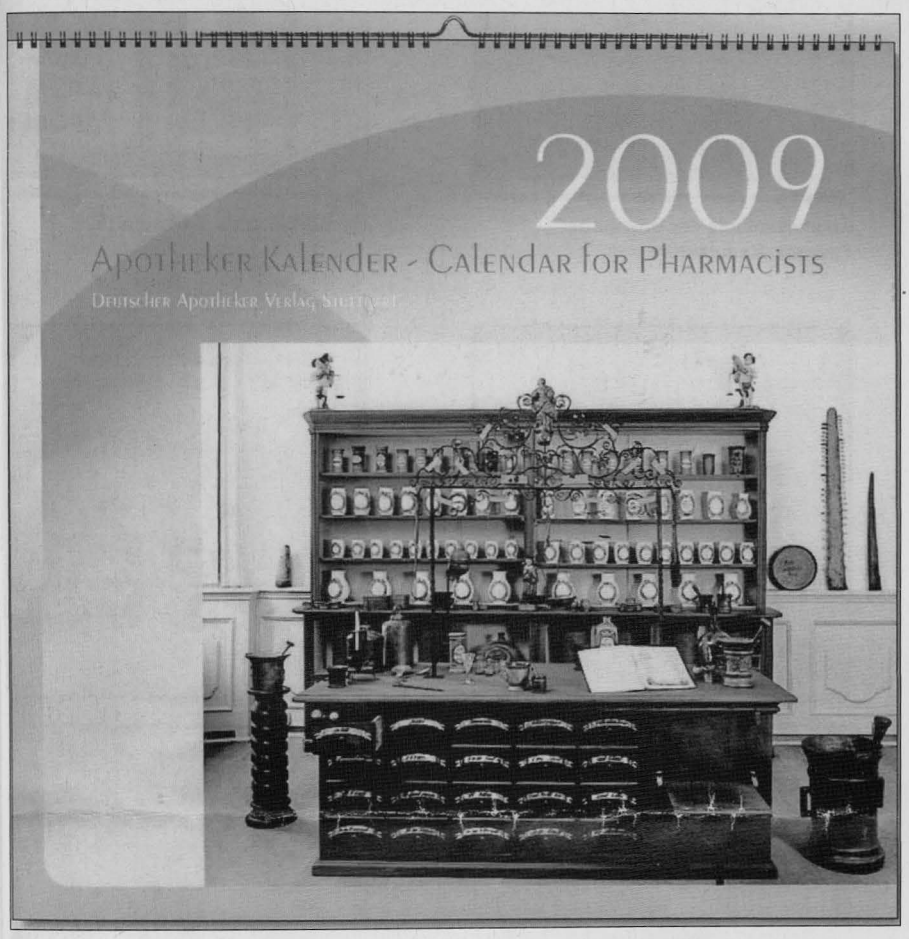
Review

Calendar for Pharmacists 2009

Prof Dr Werner Dressendörfer, 49 x 49 cm, 12 four-colour prints with monthly calendar.

With explanatory text in German and English (transl. Diane Blaurock). Stuttgart: Deutscher Apotheker Verlag. ISBN 978-3-7692-4743-5. Price 78 Euros. Order from service@deutscher-apotheker-verlag.de



This year's Calendar continues the tradition of choosing beautiful coloured prints of pharmacy history. Prof Dressendörfer's extensive German commentaries, together with their English translation, on the provenance and meaning of the objects pictured add considerably to the value of the Calendar.

Documents are represented in January by a 1776 certificate that Abraham Schwechten had served an apprenticeship of 8 years in Bayreuth and for July by a patient information leaflet for the use of terra sigillata printed in Prague in 1638. It had fortunately been preserved in a home-made family drug book.

Jars and bottles are well represented. August has three unlabelled Nuremberg faience jars with their lids from about 1760, unusually decorated in blue with the emblems of the Grand Master of the Order of Teutonic Knights, who settled in Bad Mergentheim, Baden-Württemberg in 1530. February displays two unlabelled cylindrical jars from Bayreuth with wide blue cartouches, presumably made as spares for the labelling of new drugs. For April there two ordinary lead-glazed earthenware storage jars for use behind the scenes. Three more French faience jars with lids have their labels within a circle of roses and represent October. 18th century glass bottles and jars from the 'Moor' pharmacies in Mainz and Mühlhausen appear for June. Their labels are painted within cartouches depicting Moors, three supporting the arms of the Archbishop-Elector of Mainz.

The December picture is of a fine display of mid-18th century dispensary furniture and items collected from various German sources which now adorns the pharmacy room in Seligenstadt Abbey near Frankfurt.

Pages from a printer's catalogue offer coloured pharmacy labels for products sold and dispensed by various pharmacies, while September shows a collection of postage stamps illustrating pharmacy history subjects from Portugal, Paraguay and Brazil. November has two illustrations of the Grim Reaper from Schellenberg's 'The Incarnations of the Grim Reaper in the Manner of Hans Holbein'. One shows him exploding a monk's mortar and the other a physician in a pharmacy is being visited by Death: nobody is exempt.

Finally for March, two pages from the 1500 Paris edition of the 'Hortus Sanitatis' have four coloured woodcuts illustrating trees and herbs used pharmacy, though it would be difficult to identify the plants without the accompanying text.

Once again these annotated large-format illustrations provide interest throughout the year.

Ainley Wade

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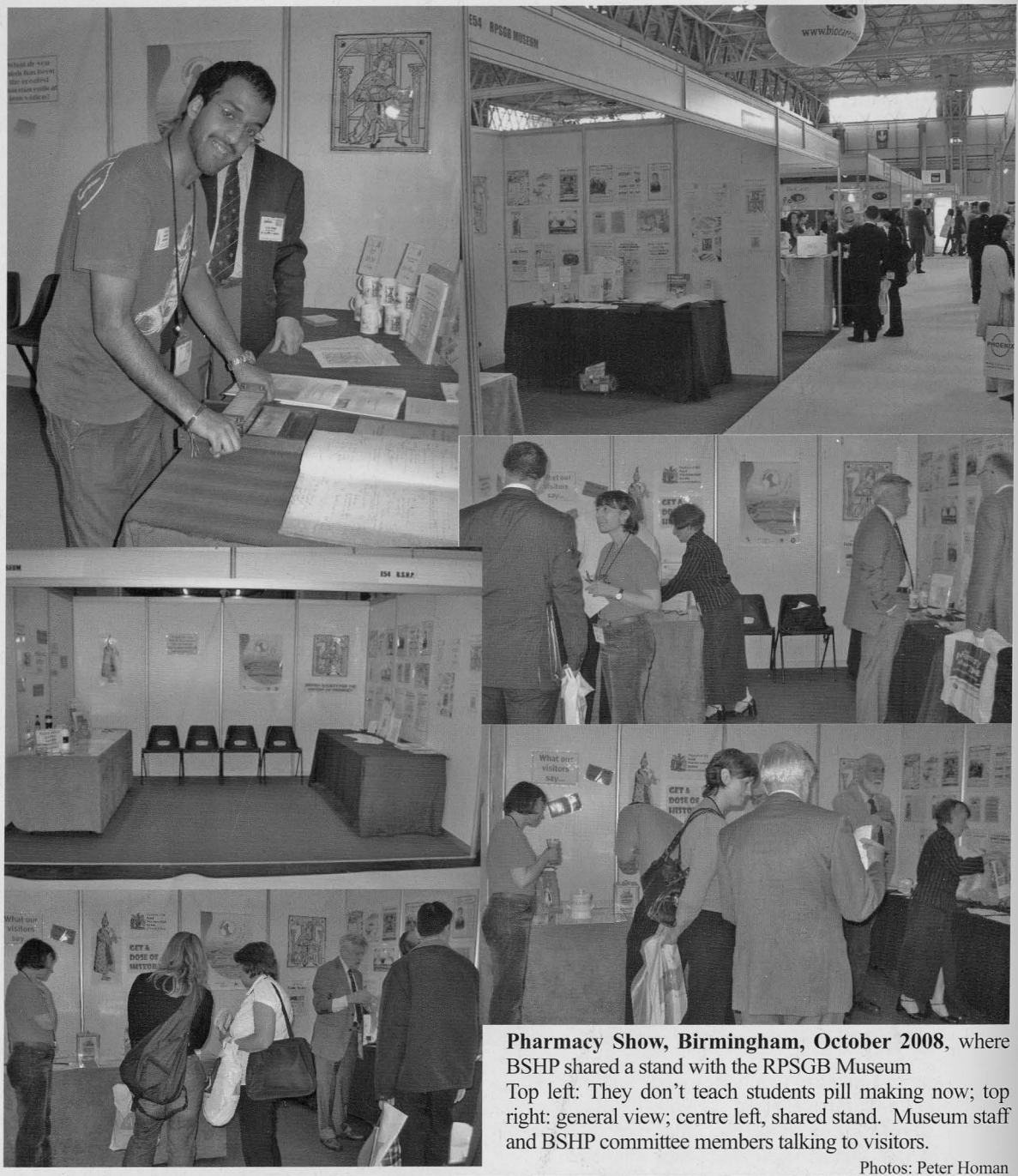

Pharmacy Show, Birmingham, October 2008, where BSHP shared a stand with the RPSGB Museum
Top left: They don't teach students pill making now; top right: general view; centre left, shared stand. Museum staff and BSHP committee members talking to visitors.

Photos: Peter Homan

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The Indexes for 1967 to 1995, 1996 to 2000 and 2001 to 2005 can now be viewed free of charge on the website: www.bshp.org under Publications.

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